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FRIDAY, FEBRUARY 28, 1896.

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MSS. intended for publication and books etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

REPORT OF THE FOURTEENTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF NATURALISTS, PHILADELPHIA, DECEMBER 26–27, 1895.

AT the first session, Thursday, December 26, 2 P. M., President Cope called for the reports of committees appointed at the Baltimore meeting: It was reported that two microtomes had been purchased by the duly authorized committee and placed at the Naples Station for the use of American students under appointment of the Smithsonian Institution. The Committee on Bibliography announced that their report had, according to instructions, been published in SCIENCE and the *American Naturalist*. The Treasurer's report was read and, after being duly audited, received.

Dr. Stiles reported that the present term of control of a table at the Naples Station would cease on June 8, 1896; that during this term eight men had been appointed to the table, and that the table had not remained unoccupied for a single month. He presented a memorial, addressed to the Secretary of the Smithsonian Institution, asking that the control of the table be continued, and requested the Society to approve the steps already taken by him and authorize him to continue. It was so voted, and on motion of Dr. Morgan it was also voted that the President appoint a committee of two, which committee should communicate to the Secretary of the Smithsonian Institu-

tion the action of the Society. Profs. Morgan and Conn were appointed on this committee.

Messrs. Lucas, Morgan, Gill, Stiles and Macloskie were appointed a committee to nominate officers for the ensuing year.

The Society then listened to the address of the President, 'The Formulation of the Natural Sciences,' and to the following paper:

Note on the Laboratory Teaching of Large Classes, by Burt G. Wilder, M. D., Professor of Physiology, Vertebrate Zoölogy, and Neurology, Cornell University.

To my great regret a year ago the simultaneous meeting of the Association of American Anatomists prevented my participation in the discussion of this topic. Our experience at Cornell has been both extensive and successful. In 1880 for vertebrate zoölogy, and in 1886 for physiology, was introduced the actual examination and dissection of representative forms and important organs by members of large classes of general students numbering from 40 to 181. For the sake of distinguishing these comparatively brief and superficial exercises from the laboratory work to which they serve as an introduction, the word *Practicum* is employed; but I first heard it from the lips of Prof. Shaler many years ago, and he perhaps got it from the Germans.

The following practical points are to be noted:

1. The advantages of Japanese napkins over towels.

2. The convenience of placing the text and plates of directions upon a two-sided rack running lengthwise of the middle of a table and secured by a clamp at each end so as to be easily removed.

3. The cheerfulness with which these general students repay to the Treasurer of the University the cost of the material and supplies, amounting to about $3.00 for each of the courses.

4. The almost uniform interest manifested in the work even by those who may shrink from it at first. Not more than one in five hundred has sought to be excused.

5. The possibility of preparing and storing the material for such large classes. For example, this fall each of the class of 186 has dissected the eye, brain and heart of the sheep and the viscera and certain muscles of a cat. For brains Dr. Fish's formalin mixture is satisfactory, but the hearts of cats are prepared with alcohol, as described by me before this Society in 1885 and 1890.

6. The desirability of requiring as much as is now done here at the practicums in both physiology and vertebrate zoölogy for admission to the University. Although elementary physiology has been an entrance requirement here since 1877, the extent of practical familiarity with organisms is very slight. Nevertheless I believe it can be increased by general and persistent effort.

After the reading of the above paper, Dr. Stiles requested that the Society elect a representative to meet with similar representatives appointed by the Smithsonian Institution and the American Ornithological Union, to consult with and advise the American member of the International Commission on Codes of Nomenclature. Prof. Cope was duly elected.

The President then announced to the Society the death, since the previous meeting, of James D. Dana and John A. Ryder.

The Society then adjourned.

SECOND SESSION, FRIDAY, DECEMBER 27, 9.30 A. M.

President Cope called for the report of the Nominating Committee, which was submitted, and the following officers were elected for the ensuing year: President, W. B.

Scott, of Princeton College, N. J.; Vice-Presidents, W. G. Farlow, of Harvard University; C. O. Whitman, of the University of Chicago; Theodore Gill, of the Smithsonian Institution; Secretary, H. C. Bumpus, of Brown University; Treasurer, John B. Smith, of Rutgers College; Executive Committee, Horace Jayne, of the University of Pennsylvania; William F. Ganong, of Smith College.

The business being finished, the Society listened to the annual discussion, which is printed below.

At the close of the discussion, on motion of Prof. Heilprin, it was voted that a committee of three be appointed by the President to inquire into the practicability and feasibility of the exploration of the Antarctic Continent and to report at the next meeting of the Society. The President appointed Professors Heilprin, Osborn and Goodale. The Society then adjourned.

H. C. BUMPUS,
Secretary.

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*THE FORMULATION OF THE NATURAL SCIENCES.**

FORMULATION is the method of presentation of the forms of our thoughts. Our observations of the facts of material nature are embodied in such classifications as we think best express their relations, and by means of these classifications expressed in language, we convey to others our conclusions in the premises. As the vehicle of presentation, formulation is one of the aspects of language, which as the medium of communication between men, enables them to accumulate knowledge. It is highly important then that the system of formulation should be uniform, so as to convey definite meaning and preserve the truth. The vast number of facts to be marshaled in orderly array, which constitute the natural sciences, require a correspondingly complex and exact formulation. The advent of the doctrine of evolution into the organic sciences involves the necessity of making such readjustments of our method of formulation as may be called for. It is with reference to this condition and the present action of naturalists regarding it, that I address you to-day. The subject may be considered under the three heads of Taxonomy, Phylogeny, and Nomenclature.

I. TAXONOMY.

Taxonomy or classification is an orderly record of the structural characters of organic beings. The order observed is an order of values of these characters. Thus we have what we call specific or species value, generic value, family value, and so on. These values are not imaginary or artificial, as some would have us believe, but they are found in nature. Their recognition by the naturalist is a matter of experience, and the expression of them is a question of tact. Their recognition rests on a knowledge of morphology, or the knowledge of true identities and differences of the parts of which organic beings are composed. The formulation of these values in classification foreshadows the evolutionary explanation of their origin, and is always the first step necessary to the discovery of a phylogeny.

Taxonomy, then, is, and always has been, an arranging of organic beings in the order of their evolution. This accounts for the independence of the values of taxonomic characters, of any other test. Thus, no character can be alleged to be of high value because it has a physiological value, or because it has no physiological value. A physiological character may or may not have a taxonomic value. The practical taxonomist finds a different test of values, which is this. He first endeavors to dis-

* Presidental address delivered before the American Society of Naturalists in Philadelphia, December 26, 1895.

cover the series of organic forms which he studies. He learns the difference between its beginning and its ending. His natural divisions are the steps or stages which separate the one extremity from the other. The series may be greater or they may be lesser, *i. e.*, more or less comprehensive, and it is to the series of different grades that we give the different names of the genus, family, order, etc.

We know that the characters of specific value in given cases are usually more numerous than those of higher groups. We know that they are matters of proportions, dimensions, textures, patterns, colors, etc., which are many. The characters of the higher groups, on the contrary, are what we call structural, *i. e.*, the presence, absence, separation or fusion of elemental parts, as estimated by a common morphologic standard; and it is the business of the morphologist to determine each case on this basis. In these characters lies the key to the larger evolution, that of the higher aggregations of living things. On the contrary, the study of the origin of species characters gives us the evolution of species within the genus, but nothing more, except by inference.

Classification, then, is a record of characters, arranged according to their values. There still lingers, in some quarters, a different opinion. This holds that there is such a thing as a 'natural system,' as contrasted with 'an anatomical system.' Examination shows that the supporters of this view suppose that there is some bond of affinity between certain living beings which is not expressed in anatomical characters. A general resemblance apparent to the eye is valued by them more highly than a structural character. If this 'general appearance' is analyzed, however, it is found to be simply an aggregate of characters usually of the species type, which by no means precludes the presence of anatomical differences. And these anatomical differences may indicate little relationship, in spite of the general resemblance of the species concerned, or they may have only the smallest value attached to such characters, *i. e.*, the generic. It is with regard to the generic characters that the chief difference of practice exists. But it is clear that the record of this grade of characters cannot be modified by questions of specific characters. The two questions are distinct. Both represent nature, and must be formulated. In fact, I have long since pointed out that the same species, so far as species characters go, may have different generic characters in different regions. Also that allied species of different genera may have more specific characters in common than remote species of the same genus.

The anticipation naturally intrudes itself that the characters which distinguish the steps in a single evolutionary or genealogical line must disappear with discovery, and new ones appear, and that they must be all variable at certain geological periods, and hence must become valueless as taxonomic criteria. And it is therefore concluded that our systematic edifice must lose precision and becomes a shadow rather than a reality. I think that as a matter of fact this will not be the result, and for the following reasons: In the first place, when, say all the generic forms of a genealogical line, shall have been discovered, we will find that each one of them will differ from its neighbor in one character only. This naturally follows from the fact that two characters rarely, if ever, appear and disappear contemporaneously. Hence, generic characters will not be drawn up so as to include several points. For a while, there will be found to be combinations of two or three characters which will serve as definitions, but discovery will relegate them to a genus each. Each of these characters will be found to have what I have called the 'expression point,' or the moment of completeness, before which it

cannot be said to exist. In illustration I cite the case of the eruption of a tooth. Before it passes the line of the alveolus it is not in use; it is not in place as an adult organism. When it passes that line it has become mature, has reached its expression point, comes into functional use, and may be counted as a character. Such will be found to be the case with all separate parts; there always will be a time when they are not completed and then there will be a time when they are. These lines, then, will always remain as our boundaries, as they are now, for all natural divisions from the generic upwards. This condition cannot exist in characters of proportionate dimensions, which will necessarily exhibit complete transitions in evolution. Hence, proportions alone can only be used ultimately as specific characters.

Some systematists desire to regard phyletic series as the only natural divisions. This may be the ultimate outcome of paleontologic discovery, but at present such a practice seems to me to be premature. In the first place, as all natural divisions rest on characters, we must continue to depend on their indications, no matter whether the result gives us phyletic series or not. In the next place, we must remember that we have in every country interruptions in the sequence of the geological formations, which will give us structural breaks until they are filled. There are also periods when organic remains were not preserved; these also will give us interruptions in our series. So we shall have to adhere to our customary method without regard to theory, and if the phyletic idea is correct, as I believe it to be, it will appear in the final result, and at some future time.

Authors are frequently careless in their definitions. Very often they include, in the definition of the order, characters which belong in that of the family, and in that of the family those that belong in the genus. Characters of different values are thus mixed. The tendency, especially with naturalists who have only studied limited groups, is to overestimate the importance of characters. Thus the tendency is to propose too many genera and other divisions of the higher grades. In some groups structure has been lost sight of altogether, and color patterns, dimensions, and even geographical range, treated as characters of genera. As the mass of knowledge increases, however, the necessity for precision will become so pressing that this kind of formulation will be discarded, and definitions which mean something will be employed. Search will be made especially for that one character which the nature of the series renders it probable will survive, as discoveries of intermediate forms are successively made, and here the tact and precision of the taxonomist has the opportunity for exercise. In the selection of these characters, one problem will occasionally present itself. The sexes of the same species sometimes display great disparity of developmental status, sometimes the male, but more frequently the female, remaining in a relatively immature stage, or in others presenting an extraordinary degeneracy. In these cases the sex that displays what one might call the genius, or in other words, the tendency, of the entire group, will furnish the definitions. This will generally be that one which displays the most numerous characters. In both the cases mentioned the male will furnish these rather than the female; but in a few cases the female furnishes them. The fact that both sexes do not present them does not invalidate them, any more than the possession of distinct reproductive systems would refer the sexes to different natural divisions.

I have seen characters objected to as of little value because they were absent or inconstant in the young. I only mention

the objection to show how superficially the subject of taxonomy may be treated. So that a character is constant in the adult, the time of its appearance in development is immaterial in a taxonomic sense, though it may have important phylogenetic significance.

II. Phylogeny.

The formulation of a phylogeny or genealogy involves, as a preliminary, a clear taxonomy. I refer to hypothetical phylogenies, such as those which we can at present construct are in large part. A perfect phylogeny would be a clear taxonomy in itself, so far as it should go, did we possess one; and such we may hope to have ere long, as a result of paleontological research. But so long as we can only supply parts of our phyletic trees from actual knowledge, we must depend on a clear analysis of structure as set forth in a satisfactory taxonomy, such as I have defined above.

Confusion in taxonomy necessarily introduces confusion into phylogeny. Confusion of ideas is even more apparent in the work of phylogenists than in that of the taxonomists, because a new but allied element enters into the formulation. It is in the highest degree important for the phylogenist, whether he be constructing a genealogic tree himself or endeavoring to read that constructed by some one else, to be clear as to just what it is of which he is tracing the descent. Is he tracing the descent of species from each other, or of genera from each other, or of orders from each other, or what? When I trace the phylogeny of the horse, unless I specify, it cannot be known whether I am tracing that of the species *Equus caballus*, or that of the genus Equus, or that of the family Equidæ. When one is tracing the phylogeny of species, he is tracing the descent of he numerous characters which define a species. This is a complex problem, and but little progress has been made in it from the paleontologic point of view. Something has been done with regard to the descent of some living species from each other. But when we are considering the descent of a genus, we restrict ourselves to a much more simple problem, *i. e.*, the descent of the few simple characters that distinguish the genus from other genera. Hence, we have made much more progress in this kind of phylogeny than with that of species, especially from the paleontologic point of view. The problem is simplified as we rise to still higher divisions, *i. e.*, to the investigation of the origin of the characters which define them. We can positively affirm many things now as to the origin of particular families and orders, especially among the Mammalia, where the field has been better explored than elsewhere.

It is in this field that the unaccustomed hand is often seen. Supposing some phyletic tree alleges that such and such has been the line of descent of such and such orders or families, as the case may be; soon a critic appears who says that this or that point is clearly incorrect, and gives his reasons. These reasons are that there is some want of correspondence of generic characters between the genera of the, say, two families alleged to be phyletically related. And this want of correspondence is supposed to invalidate the allegation of phyletic relation between the families. But here is a case of irrelevancy; a generic character cannot be introduced in a comparison of family characters. In the case selected, the condition is to be explained by the fact that although the families are phyletically related, one or both of the two juxtaposed genera through which the transition was accomplished has or have not been discovered. The same objection may be made against an allegation of descent of some genus from another, because the phyletic relation between the known species of the two genera cannot be demonstrated. I

cite as an example the two genera, Hippotherium and Equus, of which the latter has been asserted with good reason to have descended from the former. It has been shown, however, that the *Equus caballus* could not have descended from the European *Hippotherium mediterraneum*, and hence some writers have jumped to the conclusion that the alleged phyletic relation of the two genera does not exist. The reasons for denying this descent are, however, presented by specific characters only, and the generic characters are in no way affected. Further, we know several species of Hippotherium which could have given origin to the *Equus caballus*, probably through intermediate species of Equus.

Some naturalists are very uncritical in criticising phylogenies in the manner I have just described. They often neglect to ascertain the definitions given by an author to a group alleged by him to be ancestral; but fitting to it some definition of their own, proceed to state that the ancestral position assigned to it cannot be correct, and to propose some new division to take its place. It is necessary to examine, in such cases, whether the new group so proposed is not really included in the definition of the old one which is discarded.

The fact that existing genera, families, etc., are contemporary need not invalidate their phyletic relation. Group No. 1 must have been contemporary with group No. 2, at the time that it gave origin to the latter, and frequently, though always, a certain number of representatives of group No. 1 have not changed, but have persisted to later periods. Some genera, as *e. g.*, Crocodilus, have given origin to other genera (*i. e.*, Diplocynodon) and have outlasted it, for the latter genus is now extinct. The lung fishes, Ceratodus, are probably ancestral to the Lepidosirens, but both exist to-day. Series of genera, clearly phyletic, or Batrachia Salientia, are contemporaries. Of course we expect that the paleontologic record will show that their appearance in time has been successive. But many ancestors are living at the same modern period as their descendants, though not always in the same geographic region.

III. NOMENCLATURE.

Nomenclature is like pens, ink and paper; it is not science, but it is essential to the pursuit of science. It is, of course, for convenience that we use it, but it does not follow from that that every kind of use of it is convenient. It is a rather common form of apology for misuse of it to state that as it is a matter of convenience, it makes no difference how many or how few names we recognize or use. An illustration of this bad method is the practice of subdividing a genus of many species into many genera, simply because it has many species. The author who does this ignores the fact that a genus has a definite value, no matter whether it has one or five hundred species. I do not mean to maintain that the genus or any other value has an absolute fixity in all cases. They undoubtedly grade into each other at particular places in the system, but these cases must be judged on their own merits. In general there is no such gradation.

Nomenclature is then orderly because the things named have definite relations which it is the business of taxonomy, and nomenclature its spokesman, to state. Here we have a fixed basis of procedure. In order to reach entire fixity, a rule which decides between rival names for the same thing is in force. This is the natural and rational law of priority. With the exception of some conservative botanists, all naturalists are, so far as I am aware, in the habit of observing this rule. The result of a failure to do so is self-evident. There is, however, some difference of opinion as to what constitutes priority. Some of the aspects of

the problem are simple, others more difficult. Thus there is little or no difference of opinion as to the rule that the name of a species is the first binomial which it received. This is not a single date for all species, since some early authors who used trinomials and polynomials occasionally used binomials. A second rule which is found in all the codes, is that a name in order to be a candidate for adoption, must be accompanied by a descriptive diagnosis or a plate. As divisions above species cannot be defined by a plate, a description is essential in every such case.

It is on the question of description that a certain amount of difference of opinion exists. From the codes of the associations for the advancement of science, and of the zoölogical congresses, no difference of opinion can be inferred, but the practice of a number of naturalists both zoölogists and paleontologists in America, and paleontologists in Europe, is not in accord with the rule requiring definition of all groups above species. It has always appeared to me remarkable that a rule of such self-evident necessity should not meet with universal adoption. However, the objections to it, such as they are, I will briefly consider. It is alleged that the definitions when first given are more or less imperfect, and have to be subsequently amended, hence it is argued they have no authority. However, the first definitions, if drawn up with reference to the principles enumerated in the first part of this address, need not be imperfect. Also an old-time diagnosis of a division which we have subsequently found it necessary to divide, is not imperfect on that account alone, but it may be and often is the definition of a higher group. But you are familiar with all this class of objections and the answers to them, so I will refer only to the positive reasons which have induced the majority of naturalists to adhere to the rule.

It is self-evident that so soon as we abandon definitions for words, we have left science and have gone into a kind of literature. In pursuing such a course we load ourselves with rubbish, and place ourselves in a position to have more of it placed upon us. The load of necessary names is quite sufficient, and we must have a reason for every one of them, in order to feel that it is necessary to carry it. Next, it is essential that every line of scientific writing should be intelligible. A man should be required to give a sufficient reason for everything that he does in science. Thus much on behalf of clearness and precision. There is another aspect of the case which is ethical. I am aware that some students do not think that ethical considerations should enter into scientific work. To this I answer that I do not know of any field of human labor into which ethical considerations do not necessarily enter. The reasons for sustaining the law of priority are partly ethical, for we instinctively wish to see every man credited with his own work, and not some other man. The law of priority in nomenclature goes no further in this direction than the nature of each case requires. Nomenclature may be an index of much meritorious work, or it may represent comparatively little work; but it is to the interest of all of us that it be not used to sustain a false pretence of work that has not been done at all. By insisting on this essential test of honest intentions we retain the taxonomic and phylogenetic work within the circle of a class of men who are competent to it, and cease to hold out rewards to picture makers and cataloguers.

Another contention of some of the nomenclators who use systematic names proposed without description, is, that the spelling in which they were first printed must not be corrected if they contain orthographical and typographical errors. That this view should be sustained by men

who have not had the advantage of a classical education, might not be surprising, although one would think they would prefer to avoid publicly displaying the fact, and would be willing to travel some distance in order to find some person who could help them in the matter of spelling. But when well educated men support such a doctrine, one feels that they have created out of the law of priority a fetish which they worship with a devotion quite too narrow. The form of our nomenclature being Latin, the rules of Latin orthography and grammar are as incumbent on us to observe, as are the corresponding rules of English grammar in our ordinary speech. This cult, so far as I know, exists only in the United States and among certain members of the American Ornithologists' Union. The preservation of names which their authors never defined; of names which their proposers misspelled; of names from the Greek in Greek instead of Latin form; of English hyphens in Latin composition; and of hybrid combinations of Greek and Latin, are objects hardly worth contending for. Some few authors are quite independent of rules in the use of gender terminations, but I notice the A. O. U. requires these to be printed correctly. Apart from this I notice in the second edition of their check list of North American Birds, just issued, only eighteen misspellings out of a total number of 768 specific and subspecific names, and the generic and other names accompanying. These are of course not due to ignorance on the part of the members of this body, some of whom are distinguished for scholarship, but because of an extreme view of the law of priority.

In closing I wish to utter a plea for euphony and brevity in the construction of names. In some quarters the making of such names is an unknown art. The simple and appropriate names of Linneus and Cuvier can be still duplicated if students would look into the matter. A great number of such names can be devised by the use of significant Greek prefixes attached to substantives which may or may not have been often used. Personal names in Greek have much significance, and they are often short and euphonious. The unappropriated wealth is so great that there is really no necessity for poverty in this direction. It should be rarely necessary, for instance, to construct generic names by adding prefixes and suffixes of no meaning to a standard generic name already in use.

E. D. COPE.

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*THE ORIGIN AND RELATIONS OF THE FLORAS AND FAUNAS OF THE ANTARCTIC AND ADJACENT REGIONS.**

The Geology of the Antarctic Regions. ANGELO HEILPRIN, Philadelphia Academy of Natural Sciences.

Reviewing our present knowledge of the Antarctic regions, Prof. Heilprin stated that it rests almost where it was a half-century ago, when Sir James Clark Ross (1841, 1842) made his memorable cruises in the 'Erebus' and 'Terror,' and attained the high southing of 78° 10′. This was at a position almost due south of New Zealand, along a coast line, sharply defined by elevated mountain masses, to which the daring British navigator gave the name of Victoria Land. At that time other patches of ice bound land, or what was presumed to be land, had already been discovered and named by Bellamy, Biscoe, Dumont d' Urville, and Wilkes—such as Clarie Land, Sabrina Land, etc., south of the Australian continent; Enderby Land, Kemp Land, Graham and Alexander Lands, south of Patagonia—and from these had been constituted the Antarctic continent of Wilkes and of many modern geographers. Murray,

* Report of the discussion before the American Society of Naturalists, Philadelphia, December 27, 1895.

especially, has been strenuous in upholding the actuality of such a continent, but to the present time it cannot be said that its existence has been demonstrated. A number of considerations speak in favor of it, but many more facts than we now possess will be needed before anything like a satisfactory determination of this question can be assumed. It is significant in this connection that both Ross and Petermann, to whom as explorer and student we owe the better part of our knowledge of Antarctica, inclined their views against the existence of such a southern continent. In their opinions the reported land masses are of an island character, bound together perhaps not even permanently, by a vast (frequently shifting?) ice pack, the edge of which (only in small part the terminal wall of giant glaciers) is the 'great Antarctic barrier' of geographers and navigators. How far the vertical icebarrier is confluent with the cemented pack remains yet to be determined.

The only important addition to our knowledge of true Antarctica that has been made since Ross's voyage belongs to the close of the year 1893, when Larsen penetrated, in the region of the Graham Land complex, to Lat. 68° 10′ S., and brought back with him a 'departure' in the geological concept of the region under consideration. The finding of Tertiary fossils (Cytherea, Natica, etc.,) on Seymour Island (Cape Seymour) is the opening vista in an investigation which has heretofore been considered closed, and at once affords, to use a business term, a basis for consideration. Not less significant is the finding at the same locality of an abundance of tree-remains (conifers—Arancaria ?). These fragments at least show that some part of Antarctica was of the same kind of construction as the continents generally, and their special facies immediately suggests a South American relationship. Previous to 1893 the only rocks known from the ice-bound region of the far South were granites, gneisses (and related schists), the strictly eruptive and trappean rocks, and certain red sandstones (Piner's Island—Triassic?) from a very limited area. Most (and perhaps nearly all) of the higher mountains are distinctly of a volcanic nature, and many of them bear huge craters on their summits. Ross found Erebus in eruption at the time of his visit (1841), and Larsen found the mountains of Christensen and Lindenberg Islands similarly active in 1893–94. Borchgrevink, who sailed over a portion of Ross's course in 1894–95, attaining off Victoria Land, with clear water ahead of him, Lat. 74° S., confirms in almost every detail the observations of his predecessor, adding some additional facts regarding the large glaciers which descend from the heights of the Sabine Mountains. He was the first to set foot on the mainland (or main island) of Antarctica, and to him science also owes the first discovery within this realm of a rock-covering vegetation (lichens?—on Possession Island and Cape Adare).

It can hardly be said that we know much regarding either the source or the nature of the vast ice mass which makes up nearly the whole of visible Antarctica; it may or may not be in principal part of glacial construction; it may be largely or mainly an ocean-surface accumulation, extending back in its formation through hundreds or thousands of years. Until we know what is below or behind it, this question will remain unanswered. Giant glaciers there are, and an abundance of them; but over enormous expanses, where the ice barrier presents an impassable front, no visible distant ice cap, like the one of Greenland, has been detected.

In its relations to the other continents there is reason to believe that Antarctica, whether as a continent or in fragmented

parts, had a definite connection with one or more of the land masses lying to the north, and the suspicion can hardly be avoided that such connection was, if with nothing else, with at least New Zealand (and through it, with Australia) and Patagonia. In the fragmented parts of Graham Land archipelago and the outlying South Orkney and South Georgian islands, we seem to have the bond of connection with the South American main; or, more specifically, a line of curvature of the great Andean chain, which, in its broken parts, can still be traced far beyond its present continental termination. If this concept is a true one, it places before us a parallel to the Andean curvature in the northern part of the South American Continent, where the mountain system is deflected off into the broken mass of the Lesser Antilles; to the Aleutian flexure of the Cordilleran system of North America; and to the 'Apennine-Atlas' and 'Carpathian-Balkan' flexures of the Alpine mountains, the nature of which has been so clearly stated by Suess. In fact, it is hardly possible that any very extensive meridianal or latitudinal mountain chain could have been forced up through contractional force without some such deflection being represented in one or more parts of its course; and where these deflections are found they are almost certain to be areas of breakage. The disruption of the Andean system is still (or has until recently been) taking place, as is evidenced in a portion of the Chilian archipelago.

Antarctica Palæontology. PROF. W. B. SCOTT, Princeton University.

It is a truism that the most satisfactory evidence concerning the former existence of land connections which have long since disappeared beneath the sea, is to be derived from the distribution of land animals, recent and fossil. In the northern hemisphere this evidence is very extensive for all of the great land masses, and for those later divisions of geological time in which terrestrial life began to play an important part. In the southern hemisphere the case is unfortunately different, only South America having, as yet, yielded numerous and well preserved remains of Tertiary mammals. Pleistocene fossils, which have an important though somewhat inconclusive bearing upon the problem of the Antarctic continent, occur in other regions, such as Madagascar, Australia and New Zealand, but the evidence is still fragmentary and leaves much to be desired.

In the Permian we first find indications of a type of fossils, common to the southern hemisphere and distinct from the contemporary life of the northern. This is the much discussed *Glossopteris* Flora, characterized by the fern of that name, and by an assemblage of plants which is more like the Triassic than the Permian of the northern continent. The *Glossopteris* Flora has been found in India, South Africa, Australia and, quite lately, in the Argentine Republic, and obviously points to an Antarctic center of distribution. Though the distribution of the *Glossopteris* Flora does not demonstrate that the lands in which it occurs were all connected together, yet it renders such connection probable. Judging from the analogy of the existing land masses, it seems likely that the connection was rather by means of a circumpolar continent with northward extensions than through east and west land-bridges, or a great single continent occupying the site of the Indian, South Atlantic and South Pacific Oceans.

The evidence of Mesozoic fossils is very unsatisfactory. Lydekker has called attention to the likeness between the Jurassic Dinosaurs of India, South Africa and Patagonia, and, so far as it goes, this fact would indicate a general persistence of the same land connections as those which obtained in Permian times.

When we reach the Tertiary, important facts become available, but, as in the earlier ages, too fragmentary to be conclusive. A long succession of Tertiary land faunas is known only from South America. Even the most cursory examination of these faunas shows in the most unmistakable manner the extreme isolation of South America. The oldest of the Tertiary formations of Patagonia, the *Pyrotherium* beds have yielded a fauna which promises to prove of the highest interest, but as yet it is so imperfectly known that it cannot be employed in the solution of the Antarctic problem. The earlier *Miocene* (Santa Cruz) mammals of that continent are totally different from those of the northern land-masses, so much so that the correlation of horizons becomes a matter of extreme difficulty. The hoofed animals all belong to orders unknown in the north, *Toxodontia*, *Typotheria*, *Litopterna*, and the principal constituents of the fauna are immense numbers of *Edentates*, *Marsupials* and *Rodents*, with several platyrrhine monkeys. No artiodactyls, perissodactyls, proboscidians, Condylarthra or Amblypoda, neither Insectivora, Cheiroptera, Carnivora or Creodonta are known. The Edentates are all of the specifically South American type, sloths, armadillos and the like. The Rodents also are very much like those which still characterize the region, though most of the genera are distinct; they are all Hystricomorpha, neither squirrels, marmots, beavers, rats or mice, hares or rabbits occurring among them. The Primates are typically neotropical and evidently belong to the platyrrhine group. The Marsupials are partly opossums, more or less like those which still inhabit the Americas, and, what is at first sight very surprising, partly of Australian type. The latter contain both diprotodont forms (*Abderites*, *Acdestis* *Epanorthus*) allied to the existing *Hypsiprymnus* and polyprotodont genera (*Protoproviverra*, *Cladosictis*, etc.), the affinity of which to the *Dasyuridæ* is clear. Ameghino, it is true, places these latter forms in a new order, the *Sparassodontia*, but this seems unnecessary and misleading.

The fauna of the succeeding 'Patagonian formation' is of exactly the same general character and contains no new elements, but merely somewhat more advanced genera of the same orders, while the Marsupials are much reduced in numbers and importance.

In the Pliocene (Monte Hermoso) appear the first traces of the union with North America, in the presence of mastodons, horses, tapirs, deer, llamas and true carnivores, and from that time till far into the Pleistocene the intermigrations between the two continents kept up, until a large number of common types had been established.

The curious composition of the South American mammalian fauna in Tertiary times presents us with some very well-defined but extremely difficult problems. (1.) How is the presence of groups to be explained, which have a clear relationship to those belonging to the Northern hemisphere, namely the Primates, Ungulates and Rodents? An easy short cut out of the difficulty would be to assume that the relationship is only apparent and due to convergent development. It is, of course, possible that such is the true explanation, but it is most unlikely, and in the absence of any evidence in its favor we need not stop to discuss it. Much more probable is it that these groups point to some connection, direct or indirect, with the northern hemisphere, either in late Mesozoic or early Tertiary times. One would naturally expect to find that this connection was by way of North America, but there are grave difficulties in the way of such a view. As we have seen, the indigenous South American rodents were all hystricomorphs, and while this group is represented in Europe,

in later Oligocene beds, it does not appear in North America till the end of the Miocene or beginning of the Pliocene, and is very scantily represented here to-day. The Ungulates are much more distantly related to those of the north and can be connected only by remote ancestors, for the divergence is very striking in the oldest South American forms yet recovered. If the connection with the north was not by means of North America it can only have been through Africa. Admitting such connection, it is much more likely to have been due to the junction of both continents with the Antarctic land mass than to a Transatlantic bridge. Such a mode of connection would explain the very wide divergences in the character of the mammalian faunas which still exist between Africa and South America, for a circumpolar land would very likely oppose climatic barriers to migration, and confine that migration to comparatively few groups. (2) The presence of numerous marsupials of distinctively Australian type in the Tertiary rocks of South America is very strong evidence indeed that both of those continents were connected with the Antarctic land. The Australian marsupials have been much misunderstood and many observers appear to think that Australia is a sort of museum which has preserved Jurassic types to this day. As a matter of fact, these marsupials are an extremely diversified and modernized assemblage of forms, which have paralleled the placental orders in a remarkable way. Their structure is, it is true, fundamentally primitive, but their many and divergent adaptions are modern. That these marsupials indicate a land connection between South America and Australia can hardly be denied, for none of them have ever been found in any northern continent. If it be asked why this supposed migration was all in one direction, and why South American mammals did not reach Australia, several possible explanations suggest themselves. (a) The marsupials may have originated in South America and, covering the South Polar lands, have reached Australia, which was then severed from Antarctica, before the Placentals had made their appearance in South America. (b) Placentals may have reached Australia but not kept a foothold there, finding conditions unfavorable to them. These possibilities seem very unlikely and much more probable is a third explanation. (c) The Australian connection with Antarctica first existed and allowed the marsupials to spread over the polar lands. Before South America became connected with the circumpolar area, the latter was severed from Australia. Until Tertiary mammals are recovered in Australia, explanation of these curious circumstances must remain conjectural. What is known of Australian Pleistocene mammals indicates that nothing had reached that continent from South America.

Another line of evidence which trends in the same general direction as that which we have already considered is given by the Pleistocene birds of the southern hemisphere to which attention has been directed by Forbes, and more recently by Milne Edwards and others. The weight which should be given to evidence of this kind is very difficult to determine, because of the uncertainty which still obtains concerning the real relationship of the birds in question. The extinct types of wingless rails which are found in New Zealand, the Chatham Islands, the Mascarene Islands are believed by many to indicate land bridges, while Æpyornis, of Madagascar, the Moas of New Zealand, the Emeus of Australia, and the gigantic Tertiary birds of the Argentine Republic (Brontornis, Phororhacus, Opisthodactylus), are supposed to be branches of the same stock of Ratitæ. Until, however, we learn a great deal more than is known at present with regard to

the phylogeny and relationships of these great birds, I personally do not feel at all assured that we can safely reason from their distribution to problems of former land connections. On the other hand, it should be noted that this distribution is in harmony with the results reached by study of the mammals.

In conclusion, it may be observed that the facts of paleontology may best be explained on the assumption that the Antarctic land mass has at one time or another been connected with Africa, Australia and South America, which formerly radiated from the South Pole as North America and Eurasia now do from the North Pole. While this seems a highly probable assumption, much remains to be done before the history of the southern continents is as well known as that of the northern ones, and in particular many questions must remain open until the Tertiary mammals of Africa and Australia shall have been recovered. It is interesting to observe that we are again approximating to the views expressed by Rütimeyer in 1867.

Botany. Prof. N. L. Britton, Columbia College.

Prof. Britton took up the subject from the standpoint of Antarctic botany. He remarked that as nothing worth consideration was known of the flora of the Antarctic Continent, the inquiry must be restricted to a consideration of the vegetation of the extreme southern parts of South America, South Africa, New Zealand and the islands of the South Pacific Ocean. Genera of wide distribution cannot enter as factors in the inquiry, except in cases where closely related or identical species occur in two or more of these areas. Genera and species of circumtropical distribution must be considered with caution, because this distribution may or may not have a bearing on the problem. He noted that this circumtropical distribution of plants is well marked, large numbers of genera and species being common to the warmer parts of America, Australasia and Asia, and some common to tropical America and Africa. Types of cosmopolitan distribution must obviously be ignored. Types of simple organization, typically of wide distribution, cannot fairly be considered.

He submitted the following cases of distribution, selected from widely different families from the Bryophytes upward:

Musci. *Andræa pseudosubulata.* Fuegia and Australia. *Campylopus xanthophyllus.* Chile and New Zealand. The genus *Codonoblepharum* contains about eleven species, six in southern South America, three in New Zealand, two Asiatic. The genus *Hymenodon*, of six species, has two in southern South America, three in Australasia, one in tropical America. *Leptotheca Gaudichaudii* occcurs in New Zealand, at the Falkland Islands, and Cape Horn. The genus *Leptostemon* consists of about eight species, two of them in southern South America, five in Australasia, one in Ceylon.

Filices. *Grammitis australis* and *Lomaria alpina* occur in southern South America, Tasmania, New Zealand, and the latter on Kerguelan. The genus *Gleichenia*, mostly confined to the tropics, contains related species in South Africa, southern South America and New Zealand.

Coniferæ. The genus *Araucaria* contains ten species, all South American and Australasian. *Fitzroya Patagonica* occurs in Chile and *F. Archeri* in Tasmania. The genus *Podocarpus* has about forty species, South American, South African, Australasian and Asiatic.

Aponogetonaceæ. *Aponogeton* contains about fifteen species, African, Australian and Asiatic.

Alismaceæ. *Caldisia* with three species in Africa, New Holland and the East Indies.

Centrolepidaceæ. *Gaimardia australis* in

southern South America, *G. setacea* in New Zealand.

JUNCACEÆ. *Marsippospermum grandiflorum* in the Magellan region, *M. gracile* in New Zealand.

LILIACEÆ. The genus *Wurmbea* has two species in South Africa, one in Fernando Po, four in Western Australia. *Bulbinella* has ten species in South Africa, one in New Zealand, one in the Auckland Islands. *Bulbine* has twenty-one species in South Africa, two in Australia. *Cœsia* has six Australian species, three South African. *Luzuriaga* contains three species, all of southern South America, but one of them, *L. marginata*, occurs also in New Zealand.

AMARYLLIDACEÆ. The tribe Conantheræ contains four genera, three of them Chilian, the fourth at the Cape of Good Hope.

IRIDACEÆ. The genus *Libertia* has four species in Chili and four in New Zealand and South Australia.

FAGACEÆ. *Nothofagus* contains twelve species, and is confined to southern South America, New Zealand and Australia.

URTICACEÆ. *Australina*, with five species, natives of Australia and South Africa.

PROTEACEÆ. All the genera are austral. According to Engler the species are distributed about as follows: Australia 591, South Africa 262, tropical South America 36, New Caledonia 27, tropical East Africa 25, Chile 7, tropical Africa 5, New Zealand 2, Madagascar 2.

POLYGONACEÆ. The genus *Muehlenbeckia* is confined to Australia, New Zealand, the Pacific Islands and southern South America and the Andes.

MONIMIACEÆ. *Laurelia sempervirens* in Chile, *L. Novæ-Zealandiæ* in New Zealand.

UMBELLIFERÆ. The genus *Azorella* with 30 species distributed in Australia, New Zealand, southern South America and the Andes.

EPACRIDACEÆ. The whole family is Australasian, save one species occurring at Fuegia.

STYLIDEÆ. The genus *Phyllachne* has one species in the Magellan region, three in New Zealand.

In closing, Professor Britton remarked that despite the occurrences cited, and that he had not been able to treat the subject exhaustively, the similarity of the floras was in reality very slight, and that in his opinion it was not necessary to invoke former land connection across the Antarctic region in explanation.

The Terrestrial Invertebrata. By PROF. A. S. PACKARD, Brown University.

In comparing the terrestrial Arctic and Antarctic regions the conditions are most unlike, and literally as wide apart as the Poles. The Arctic regions form a large proportion of the land hemisphere, with a comparatively abundant terrestrial flora and fauna. During the Neocene Tertiary, the arctic land masses were more extensive than now, more continuous, and with little doubt their subtropical life-forms, both plant and animal, constituted an assemblage which sent out waves of migration passing southward and colonizing either side of the American and Eurasian, late Tertiary, continents. The present Arctic and Alpine life, as also the plants and animals of boreal and north temperate Eurasia and America are with little doubt the modified descendants of the Tertiary Arctic regions.

When we pass to the South Pole the conditions are, in the light of our present knowledge, diametrically opposite. The continental Antarctic land masses may or may not be connected. Until 1893 a human being had not landed on the mainland, and even then the ice and snow-clad land revealed only a few lichens, and the rocks a few specimens of Tertiary strata. Not a trace of terrestrial invertebrate life was discovered.

Should, as it is to be earnestly hoped, an Antarctic expedition at no distant day ex-

plore the mainland, it may be predicted, judging by what we know of the invertebrate land fauna of Kerguelen Island, that one or two Lumbricoid worms, a terrestrial mollusc, one or two species of spiders, several species of acarina, and of Collembola, a few species of Coleoptera, Lepidoptera and Diptera (including perhaps a mosquito), and possibly some species of parasitic Hymenoptera, will be found to constitute the land invertebrate fauna.

Should any flowering plants ever be discovered, there will probably be added to the list a few of the higher moths, and possibly a butterfly, a bumble bee or two, and a few muscids, which in the high Arctic regions visit flowers. As there are no land birds or indigenous mammals, nor so far as we know any summer migrant birds, such insects if present should abound in individuals, there being no larger animals to reduce their numbers.

We may now proceed to enumerate the terrestrial fauna of Kerguelen Island, the nearest region of whose land invertebrates we know anything.

VERMES. Family Lumbriculidae.

Acanthodrilus Kerguelensis Lankester. (Inhabiting fresh water streams or pools?)

MOLLUSCA.

Helix hookeri Pfr.

ARACHNIDA.

Myro Kerguelensis Cambridge. Tents numerous under large stones.

Acarus, two species, a red mite on the leaf stalks of the Kerguelen cabbage; and a yellow species abounding on the sides of rocks frequented by cormorants. (Also bird-mites, mallophaga, on marine birds.)

INSECTA. *Collembola.*

Tullbergia antarctica Lubbock, in moss.

Isotoma sp.

Smynthurus sp. under stones.

COLEOPTERA.

Rhyncophora or weevils' six species, also a Staphylinid (*Phytosus atriceps*). These occurred in moss or under stones. Kidder states that "most of the species were incapable of flight, their wing-cases being soldered together." Some of the largest forms were good fliers, however, "the largest and most brilliantly colored specimen taken having flown into my hut one night, attracted by the light." Besides these "little black beetles were caught on rocks near the sea and about the roots of wet tufts of moss." They belong to the genus Octhebius, of the aquatic family Helophoridæ.

LEPIDOPTERA.

Dr. Kidder captured "two lepidopterous insects of moderate size, with very imperfect and abbreviated wings, active in their movements." Mr. Eaton found quite a number of larvæ and pupæ of a small nocturnal moth, remarkable for the extreme brevity of the second pair of wings. He names it *Embryonopsis halticella.*

DIPTERA.

Besides *Musca canicularis* Linn., a cosmopolitan species, six species of flies belonging to new genera, four of which have vestigial wings, are characteristic of this island, and are of peculiar interest.

Dr. Kidder remarks of three of the genera of wingless flies that they counterfeited death when in danger. The carrion feeder (*Anatalanta aptera* Eaton) has no vestige of either wings or balances (halteres).

The leaf feeders (*Calycopteryx mosleyi* Eaton), found on the leaves of the Kerguelen cabbage, resembled large black ants, as they were active in their movements, dark brown, with long legs. The wings are reduced to small scales.

"The third genus (*Amalopteryx maritima* Eaton) was discovered on wet rocks at the

edge of the sea. They are provided with small triangular vestigial wings and balancers." They cannot fly, but seem to use the wings in jumping, which they do with great activity, making it quite difficult to catch them. They do not appear to jump in any definite direction, but spring into the air, buzzing the small winglets with great activity, and seem to trust to chance for a spot on which to alight, tumbling over and over in the air. I never observed them jumping when undisturbed.

Dr. Kidder adds that 'the only flying insect observed by me while on the island' (he apparently momentarily overlooked the larger flying weevil) was a small gnat. Mr. Eaton also describes a tipulid (*Halyritus amphibius*) with imperfect or abortive wings.

Of the exact relationship and origin of this restricted island fauna, but little in the present state of our knowledge can be said. To which family the moth belongs I am at present unable to state. As to the Diptera they are mostly muscidæ, and this family is more largely represented in the Arctic regions and on Alpine summits the world over than any other group. But this is not the case with the Coleoptera; of this order the Carabidæ are most numerously represented in Arctic and Alpine regions, and they are common in Chili, while the weevils are the least in number of species in Arctic regions. And yet out of the eight species of beetles inhabiting Kerguelen Island, six are weevils, a group most numerously represented in subtropical and tropical regions. This would seem to indicate that this island was colonized by waifs from the land to the westward, whether from Australia, Africa or South America, I should not dare to say. On the other hand, the land plants and the marine fauna appear to have elements more in common with Patagonia and Fuegia, and this may be explained by the cold polar current which is said to flow from the Antarctic region towards Cape Horn.

Darwin has, in his Origin of Species, called attention to a remarkable feature of the Madeiran Coleoptera, *i. e.*, the unusual prevalence of apterous or wingless species. No less than twenty-two genera which are usually or sometimes winged in Europe having only wingless species in Madeira. Mr. Wallaston discovered that 200 beetles out of 550 species then known to inhabit Madeira are so far deficient in wings that they cannot fly. These facts led Darwin to believe "that the wingless condition of so many Madeira beetles is mainly due to the action of natural selection, but combined probably with disuse. For during many successive generations each individual beetle which flew least, either from its wings having been ever so little less perfectly developed or from indolent habits, will have had the best chance of surviving from not being blown out to sea; and, on the other hand, those beetles which most readily took to flight could oftenest have been blown to sea and thus have been destroyed." On the other hand, the wings of the flower-feeding Coleoptera and Lepidoptera, which are habitually on the wing, 'have, as Mr. Wallaston suspects, their wings not at all reduced, but even enlarged.' He adds that the proportion of wingless beetles is larger on the exposed island Desertas than in Madeira itself. Mr. Wallace, in his great work, 'The Geographical Distribution of Animals' (ii., pp. 211), cites the wingless insects of Kerguelen Island as a remarkable confirmation of this theory.

The poverty of the land fauna of Kerguelen Island, and the reduction in the wings of the insects, are so intimately correlated with the extremely unfavorable climatic condition under which these animals exist that the loss or reduction in the size of the wings may, we venture to suggest, be explained as the result of the direct action of some of the primary factors of organic evolution.

As Dr. Kidder states: "The general aspect of the island is desolate in the extreme. Snow covers all the higher hills. Only along the seashore is a narrow belt of herbage, of which the singular Kerguelen cabbage is at once the largest and most conspicuous component. The weather is also extremely inclement, there being scarcely a day without snow or rain. Violent gales of wind prevail to an extent unknown in the same northern latitude. It was often impossible to go on foot any considerable distance from the home station on account of the severity of the wind. Sir J. Clarke Ross tells of one of his men being actually blown into the sea, and of saving himself from a like accident only by lying flat on the ground." There are no shrubs or trees on the island. The winter season is remarkably mild.

This set of climatic conditions, the continued strong winds, the low temperature throughout the year, and the absence of the sun for the greater part of the year constitute an environment sufficient, we should think, to account for the disuse and resulting atrophy of the wings without invoking the aid of natural selection, unless we allow that the principle may work as a final and subordinate factor. At all events, these agencies and disuse should be the first to suggest themselves, as they are so tangible and easily understood.

Under these conditions the beetles, flies and moths would be driven to seek shelter under stones or by burrowing deep in the damp wet moss. By simple disuse, the wings would begin to atrophy, and after a comparatively few generations become reduced, or in extreme cases almost entirely lost. Certainly the initial cause is the climatic conditions. To these persisting century after century the organism would directly respond, and we do not see the need of evoking the aid of natural selection, ingenious and speculative as it is, any more than in accounting for the loss of eyesight or of eyes, with important parts of the brain, in cave animals, or in deep sea or abyssal forms, we should resort to natural selection. Moreover Darwin himself expressly stated that in the case of cave animals natural selection was not operative. Certainly in the present case disuse due to the direct action of the environment appears to be an efficient, adequate cause.

Vertebrata of the Land; Fishes, Batrachia and Reptiles. By Dr. Theo. Gill, Washington.

Dr. Gill called attention to the discrepancy between the evidence already deduced from the plants and invertebrates and that which would result from the consideration of the higher vertebrates. These discrepancies are in accord with the differences in the geological history of the several classes. For example, all the families of mammals, so far as certainly known, have originated since the commencement of the tertiary; most of the prominent families and very many genera of mollusks still existing, flourished at least as early as the Jurassic and Cretaceous. (The Jurassic fresh-water faunas were especially considered.) Fishes are intermediate between those two types. Naturally, the persistence in duration of the several classes is reflected in the distribution in space. Many families of mammals are confined to special zoögeographical continents, but extremely few families of articulates or mollusks are so limited. In fact, we can avail ourselves of the data furnished by the different divisions for chronometrical purposes; the mollusk answers to an hour hand, the mammal to a minute hand. The fishes yield data for the determination of intermediate points. Remembering these postulates, the evidence given by the distribution of the fresh-water fishes is significant; less so is that of the amphibians and reptiles because they have superior means of locomotion.

There are two families of fresh-water fishes confined to the cold and temperate waters of the southern hemisphere and generally distributed in such ; they are the Galaxiids and Aplochitonids ; the former were associated by the old ichthyologist with the pikes, and the latter with the salmonids, but they really have no such relationship, but are closely related to each other and segregated from all others. The Galaxiids are represented by one genus, *Galaxias*, of which about five species occur in South America, five species in Tasmania, ten species in Australia and five species in New Zealand. (A monotypic genus, *Neochanna*, is confined to New Zealand.) The Aplochitonids number only six species, referable to two genera; of these two are found in South America (*Aplochiton*,) two in Tasmania (*Aplochiton* and *Prototroctes*), one in Australia and one in New Zealand (*Prototroctes*).

It was long supposed that no species of either family of Galaxioidean fishes occured in Africa, but last year Dr. Steindachner described a representative of *Galaxias* (*G. capensis*) and consequently we now have South Africa to consider with reference to a former community of population and continuity of land of all the southern hemisphere.

The conditions of existence and propagation of fresh-water fishes were then discussed and the chances against diffusion of any fresh-water fish across the ocean or by other means than natural water courses were weighed.

In finally taking into consideration the limited distribution northwards and the close relationship of the species of the several regions referred to, it was urged that the evidence in favor of a former Antarctic continental area was strong, and, in view of the affinities of the species of the now distant regions, the conclusion was logical that the time of disruption was not remote in a geological sense. It was suggested that such disruption might have been coëval with the final uplift of the Andes.

The amphibians and reptiles furnish no data bearing directly on an Antarctic continent, but do yield some (though very slight) bearing on an earlier and more northern connection of the southern continents. Much more cogent and less ambiguous is the evidence resulting from the study of the fishes.

The fishes of tropical Africa may be ranked under two grand categories. One of these comprises species of genera or groups represented more largely in Asia, and the other of forms related to types otherwise confined to tropical America. These Afric-American forms belong to the extensive families of Characinids and Cichlids or Chromids. Fishes of these families are the most conspicuous and numerous in both continents. The representatives of the two families of the different continents always belong to different genera, and often to different groups of genera or subfamilies. We have, therefore, in the fishes, as in the mammals, conflicting evidence. According to one set of facts, the continents of Africa and Asia are similar, and, in fact, they have been united to form one zoölogical realm; according to the other the primitive fauna of Africa is more like that of America. Just two decades ago (1875) the speaker explained this apparent contradiction by the assumption that the aboriginal types had been early derived from a common source, and, for that reason, combined Africa with South America and Australia in a zoölogical hemisphere which he named EOGÆA, and contrasted with another called CÆNOGÆA, embracing Asia, Europe and North America. The numerous species congeneric with Asiatic and European types, were considered to be recent emigrants, geologically considered. The purport of all the evidence was that there may

have been some connection between Africa and South America early in the tertiary epoch. This connection in the present condition of our ignorance of paleontological facts, appears to be more probable than the derivation of the common peculiarities of the faunas of the two continents from a former cosmopolitan fauna or northern areas which have lost them, leaving them to the two southern continents only. The union of Africa with Asia culminated too late to allow of much differentiation of the invading forces that spead over its wide domain.

A former quasi-cosmopolitan fauna was nevertheless manifest in the case of the Ceratodontids, but in Europe and North America they flourished early in Mesozoic times, and none survived later than the Jurassic, and approximately coëval with them were species which lived in India and Africa, but all these died out and the only survivors are the species of *Neoceratodus* of tropical Australia. This family was mentioned as an extreme case of persistence for an osseous fish type.

The amphibians furnish very ambiguous evidence if the accepted taxomy is correct. For example, on the one hand the Cystignathids are well developed and limited to America and Australia, but on the other the Discoglossids are all European, except one genus (*Liopelma*), and that is confined to New Zealand.

The reptiles contribute data looking in different directions. One of the ablest herpetologists of all time has expressed the opinion that 'if a division of the world had to be framed according to the lizard faunas,' the Ethiopian and Palæarctic regions should be combined in one (*Occidental*) and the Australian and oriental in another (*Oriental*), to be themselves aggregated in a realm (Palæogean) differentiated from another (Neogean), comprising the Neotropical and Nearctic regions. Their mode of distribution in fact approximates that of birds, but has been seriously affected by their intolerance of cold and consequently the loss of types, which might be interchanged between the continents. The similarity between the African and Palæarctic regions is doubtless due to the intrusion of forms from the latter into the former. The African, however, has three small families restricted to its area and two shared with America. Quite different is the distribution of the tortoises.

The superfamily of the Pleurodirous or Chelyoidean tortoises is restricted to the southern continents. One family (Sternothærids) is peculiar to Africa, one (Chelyidsé to America and one (Chelodinids) to the Australian realm, while one (Podocnemidids) is common to Africa and America, and another (Rhinemydids) to America and Australia. Except in America these completely replace the fresh water cryptodirous tortoises, but it is noteworthy that species of the terrestrial Testudinids, generally considered as congeneric, occur in all the warm continents except the Australian. It must not be forgotten that formerly (in early tertiary times) the Chelyoideans were represented and, it has been claimed, even by a still existing genus (*Podocnemis*) in the northern hemisphere, and therefore their present occurrence only in the southern continents loses much of its significance. The evidence of former connections of the southern hemisphere furnished by both amphibians and reptiles is indeed of very little account *per se* and is only significant as collateral to that presented by other classes.

To sum up the results of studies of the several classes, the present evidence points to a comparatively recent union of or connection between the southern continents. The inference (independent of the ichthyological data) is based in part on the information respecting the geological duration of

mammal families derived from studies of northern strata and in part on the identification of mammal remains of Patagonian strata with Dasyurids, but this evidence may prove illusive. Of some importance in estimating the age is the rediscovery by Mr. Thomas after 20 years of the *Hyracodon* of Tomes and its reference to the supposed extinct family of Epanorthids. This evidence, however, is by no means conclusive. Rather violent assumptions become necessary of remarkable dynamical conditions and the peopling of the said continents by the same type may be hereafter explained otherwise. But in the present condition of our knowledge (or ignorance, if you will), less violent assumptions appear to be called for by the hypothesis that has now been presented than by any other. It must be distinctly understood, however, that it is a hypothesis and a *tentative* hypothesis only. But until it is replaced by a better one or by ascertained facts, the hypothesis will assuredly be useful in directing investigation.

Vertebrata of the Land; Birds and Mammals. By DR. J. A. ALLEN, American Museum of Natural History, New York.

So far as existing mammals and birds are concerned, there seems to be very slight need for calling in the aid of a former Antarctic continent to explain their present distribution. Among mammals the distribution of Marsupials alone gives a hint of a possible former land connection between South America and Australia. The recent discovery (Thomas, Ann. and Mag. Nat. Hist. (6) XVI., Nov. 1895, p. 367) of a form of Marsupial in Colombia belonging to the hitherto supposed extinct family Epanorthidæ, and the occurrence of several distinctly Australian types among the fossil Marsupials of Patagonia, would seem to add much emphasis to this hint. On the other hand, the absence of all other South American types of either mammals or birds from the Australian region, and the presence of the remains of numerous opossum-like animals in the Eocene of both North America and Europe, suggest a possible line of extension by way of the northern land masses without the aid of any former land bridges in the southern hemisphere. Possibly worthy of consideration here is the wide distribution of Mesozoic mammals and the probable Marsupial affinities of at least some of them.

In regard to birds, after excluding wide-ranging types, which have no bearing on the subject in question, there are no groups common to South America and either Africa or Australia. The distribution of the so-called Ratitæ and other flightless birds so often cited as evidence of a former Antarctic continent, has really very little bearing on the question. The so-called sub-class Ratitæ includes, according to the best recent authorities, no less than six orders, of which the South American rheas (Rheæ) form one, and the only one found in the New World; the ostriches of Africa form another (Struthiones), which in Pliocene times ranged as far north and east as southern Europe and India; the kiwis of New Zealand form a third (Apteryges); the cassowaries and emus of the Australian region a fourth (Megistanes); the recently extinct genus *Æpyornis* of Madagascar a fifth (Aepyornithes), and the recently extinct moas of New Zealand a sixth (Immanes). The prevalent notion that all these forms are closely related and must have had a common origin doubtless rests on such superficial resemblances as large size and flightless condition.

Mainly for the same insufficient reason it is the fashion to refer to the Ratitæ such little known extinct forms as *Gastornis* and *Dasornis* of Europe, *Diatryma* of North America, and *Brontornis*, *Phororhacos*, *Pelycornis*, *Opisthodactylus*, etc., of Patagonia. Although

some of them appear to have Ratite affinities, others present quite as strong relationship to Carinate types. Most of them are known, however, from such fragmentary remains that little can be said as to their real affinities. Indeed, it is the belief of several eminent authorities that the so-called Ratitæ constitute a very heterogeneous group, the prominent types of which originated independently from perfectly distinct Carinate ancestors. The fact of the occurrence, either still living or only recently extinct, of degenerate flightless forms in such widely distinct Carinate groups as parrots, birds of prey, pigeons, ducks and geese, coots, gallinules and rails, auks, grebes, etc., and that they are in general among the largest members of their respective groups, and also generally inhabitants of islands, shows that mere flightlessness, large size, insular habitat, and an unkeeled sternum are factors of slight importance.

Mr. H. O Forbes in his plea for an Antarctic continent (Antipodea) originally laid great stress upon his discovery at the Chatham Islands of an extinct flightless rail allied to an extinct flightless rail of the genus *Aphanapteryx* found in Madagascar. Indeed, this discovery seems to have been largely the foundation of his original 'tremendous hypothesis,' as Mr. Wallace has called it, of an Antarctic continent. In Madagascar *Aphanapteryx* was contemporary with the dodo, both existing down to about two hundred years ago. The Chatham Island remains were found in kitchen middens of the Morioris, showing that here the supposed *Aphanapteryx* existed to a comparatively recent date. Later examinations by competent authority, however, of the Chatham Island remains has shown that they are not congeneric with *Aphanapteryx*.

It is of interest to note in this connection that some ten genera of flightless Ralline birds are known, three or four of which are still living, while most of the others have become extinct only within historic times. They are all island birds, and nearly all happen to occur in the southern hemisphere, the localities being the islands of Mauritius, Rodriguez, Gough, Tristan d' Acunha, Samoa, Chatham, and New Zealand, but ranging north also to the Moluccas. Furthermore, it happens that they represent all of the leading types of the family Rallidæ, as rails, coots, gallinules and porphyrios, and hence have no very intimate relationship. The fact of their being insular forms thus has not necessarily any bearing on the question of former southern land areas, especially since they are as much tropical and subtropical as austral, and belong to an ancient type of bird life of cosmopolitan distribution. The current belief among ornithologists is that all these forms originated at or near where they are now found from ancestors that could fly. In support of this belief is the fact that one of the earliest marks which distinguish insular forms from their nearest mainland allies and probable ancestors is the reduction of the wings and the corresponding increased development of the pelvic limbs, as is illustrated in the birds of the Guadalupe Islands off the coast of Lower California, and the Galapagos Islands. This change is obviously the result of the new conditions of life—the very limited area to which they are restricted, their sedentary and non-migratory habits, and their comparative freedom from harrassing rapacious enemies.

The Ratitæ and supposed Ratite forms which have so generally been cited in evidence of former connected Antarctic land areas, in reality afford no greater proof of such land bridges than do Carinate birds, when we consider how very distinct are the ordinal groups into which this subclass is divided, and how widely each one is separated geographically from all the others. If we had moas, or ostriches, or kiwis, or cassowaries, or any one of the six orders

represented in all three of the present southern continents, or in even two of them, the case would be different. The single order Passeres includes families peculiar respectively to South America, Africa and Australia, which are far more closely related to each other than are the several orders of the Ratitæ *inter se;* yet no one thinks of urging these Passerine groups as evidence of a former Antarctic continent. They are supposed to have originated independently where they are now found and to have never existed elsewhere.

There are, on the other hand, several families of Carinate birds, belonging to different orders, which inhabit the tropical and subtropical regions of both the Eastern and Western hemispheres, but which now and for long ages past have had no possible means of migration from America to Africa, or to India, or to Australia. That the present New World and Old World representatives of these several groups must have had, respectively, a common origin is beyond question; and it is believed to be equally beyond question that they reached their present areas of distribution by the northern land route that formed the means of intercommunication between the northern land masses for so many of the widely dispersed terrestrial forms of life.

Another factor bearing on the general question is the early origin of many of the existing genera of birds, most of the known Pliocene genera still surviving, while many of the Lower Miocene and Upper Eocene genera of Europe and North America are in some cases identical, in others closely allied, to genera still living. Some of them are now restricted to the tropics, but their ranges formerly extended far to the northward of their present limits.

In short, birds afford no clear evidence in favor of the existence of a former Antarctic continent, and mammals only that afforded by the distribution of the Marsupials.

Vertebrata of the Sea. By THEO. GILL, Washington.

On account of the enforced absence of Dr. Goode, detained in Washington by official business, and at his request, Dr. Gill considered the subject assigned to him—the fishes of the sea in relation to the Antarctic continent.

There is really no direct evidence furnished by sea fishes bearing on the question at issue. There are, however, some facts which may throw light on a certain phase of the question. The fishes of the Antarctic seas are very imperfectly known, but the few that are known are of much interest and belong to two very distinct categories.

On one hand, we have a few species belonging to a couple of families only occurring in the extremely cold waters—the Chænichthyids and Harpagiferids. The genera of these families have been referred to the family of Trachinids, but really manifest no affinity to the typical forms of that group. The only inference that appears to be derivable from the two families is that the supposititious Antarctic continent may have been in all Tertiary geological times at least deeply indented by extensions of the ocean far towards the Pole.

On the other hand, in the Antarctic seas recur representatives of genera which have been only found in high northern waters, such as *Myxine*, *Squalus*, and *Merlucius*, and those representatives are so closely related as to have been united in two cases as conspecific. It appears to be most reasonable to postulate for such types derivation from a common source, and that their extension may have been effected in the cold waters of the ocean depths. It is more than possible that, under favorable conditions, species of *Myxine*, *Squalus* and *Merlucius* may yet be found in the cold deep waters below even equatorial seas, for it is to be remembered that all have an extensive bathymetrical range.

Another fact of interest and significance is that there are very few types of Gadids in the Antarctic or cold temperate seas. Their place is taken by representatives of a family of acanthopterygian fishes apparently related to the Chænichthyids and Harpagiferids already mentioned; the Nototheniids, as they are called, are of many closely related species, and in their mode of occurrence and habits appear to be analagous to the codfishes of the north. Their distribution, however, does not throw the least light on the question of an Antarctic continent.

SCIENTIFIC NOTES AND NEWS.

ASTRONOMY.

THE *Astronomisches Jahrbuch* for 1898 has just been issued. It is volume No. 123 of the series, and its preparation has been supervised by Dr. P. Lehman, who was placed in temporary charge of the Berlin computing bureau after the death of Prof. Tietjen.

THE *Astronomical Journal* of February 17th contains a determination of the elements of the orbit of the binary star F. 99 Herculis, by Dr. T. J. J. See. The orbit obtained is very remarkable because of the fact that the inclination comes out exactly zero. It follows that we see the orbit just as it is, instead of its being projected on the sky with more or less foreshortening. Some uncertainty attaches to this interesting orbit, however, because a former orbit by Mr. Gore and one by Dr. See himself agree in making the inclination more than thirty degrees. H. J.

Nature states that at the last meeting of the Royal Astronomical Society, the Astronomer Royal gave some particulars relating to the progress at Greenwich of the international photographic star catalogue. A special staff for dealing with this work has been organized under Mr. Hollis, and already 130 of the plates taken for the catalogue have been measured. It is estimated that 180 plates can be measured, and 160 of them reduced in the course of a year, so that at this rate the section allotted to Greenwich, comprising about 150,000 stars, will be completed in five or six years. Assuming that the other sixteen coöperating observatories are proceeding equally well, the world will soon be in possession of a colossal catalogue, comprising between two and three million stars.

EXTINCTION OF THE BUFFALO.

SECRETARY LANGLEY in his annual report, just issued, makes the following appeal for the preservation of the Buffalo in the National Park:

When the Yellowstone Park was organized it was believed that a permanent place of refuge for the buffalo had been secured, and that out of the natural increase of the hundreds then remaining representative herds would be preserved for future generations. It seems now evident that the condition in the Yellowstone region are such that the extermination of the Government herd of buffalo may be anticipated, and that it may be accomplished within a very short space of time. The superintendent of the Park appears not to have adequate means for their protection, and there are on the border plenty of persons whose respect for law is insufficient to keep them from poaching when the prize is a buffalo head or skin which will readily sell for several hundreds of dollars. The temptation to these men seems to be irresistible, and as the herd diminishes, the value of the animals increases and the difficulty of protection becomes constantly greater.

Since, then, the extermination of the Yellowstone herd seems rapidly approaching, something should at once be done, that this may not mean the extinction of the Government control of the species, with the death of the few specimens now in captivity. Only one course suggests itself as completely efficient—transference of the great part of the now few remaining animals to a region where they can be effectively protected and increase normally under natural conditions, in which case the bison need not vanish from the face of the earth. Two years ago there were supposed to be 200 in the Yellowstone Park. The present estimate is one-quarter of that number. The superintendent reports them as being 'constantly pursued,' and in another year there may be none left. If these animals, or a majority of them, can dur-

ing the next few months be transferred to the National Zoölogical Park at Washington, which affords room and security, they will be safe, and their natural increase in the future can be distributed by exchange with the zoölogical gardens of the various parts of the United States, so that no large city need be without its representatives of the great herds so often referred to in our early history, and now a memory.

GENERAL.

THE *Kansas University Quarterly* announces that a discovery of much interest has recently been made in western Kansas of an extinct species of Bison, the skull having an expanse of nearly four feet. Embedded below the humerus of the skeleton was a small but perfectly formed arrow head. The Bison has not yet been identified with certainty, but seems closely allied to *B. antiquus*, though evidently larger. The formation is apparently the same as that which yielded the skeletons of Platygonus, recently obtained by the University of Kansas. The Bison skeleton, that of a bull, will be mounted shortly in the University museum.

IN the last *Berichte*, G. W. A. Kahlbaum calls attention to the fact that the so-called Liebig's condenser was not devised by Liebig, but by a student of medicine at Göttingen, Christian Ehrenfried Weigel. In his dissertation 'Observationes chemical et mineralogical,' which was defended March 25, 1771, he describes and figures a condenser similar to the ordinary 'Liebig,' except that the upper end of the cooler is open and overflows into a funnel, instead of having a tube to convey away the water. Liebig never claimed to be the inventor of his condenser, but describes it in his 'Handbuch' (1843) as 'der Göttling'sche Kühlapparat,' while Göttling in his 'Almanach' (1794) rightly ascribes its invention to Weigel, who was then professor of botany and chemistry at Greifswald.

THE February number of *Science Progress* contains a translation of Prof. Ostwald's address on scientific materialism of which Prof. Remsen gave a full account in a recent (February 14th) number of this JOURNAL.

GUSTAV FOCK, of Leipzig, offers for sale several valuable libraries including the chemical library of the late Prof. Lothar Meyer. This library contains about 10,000 volumes and dissertations and is offered for sale at the moderate price of M. 7,200.

REV. J. J. THOMPSON has announced a paper to be read before the Royal Society of London on February 13th, on the discharge of electricity produced by the Röntgen rays and the effects produced by these rays by dielectrics through which they pass.

THE *Botanical Gazette* states that the *Pharmaceutische Rundschau* has changed its name to the *Pharmaceutical Review*, and is hereafter to be published chiefly in English, though not to the exclusion of German articles. The veteran editor, Dr. Fr. Hoffmann, retains his connection with the *Review*, but has associated with himself Dr. Edward Kremers, Director of the School of Pharmacy of the University of Wisconsin. The direct coöperation of seven of the leading pharmacists and chemists has been secured, and their names appear upon the title page. The place of publication also changes from New York to Milwaukee, where the Pharmaceutical Review Publishing Co. has charge of all business matters.

TWO yew trees on the new grounds of Columbia College, said to be about one hundred years old and the finest in America, were in the way of the approach to the library and are being moved. The roots have been carefully excavated while the earth is frozen to them. It is curious that these trees were presented to the Bloomingdale Asylum by the trustees of Columbia College when they acquired the Hosack Botanical Garden, which is now the estate from which the College receives a large part of its income.

IT is stated in the last issue of *Nature* (February 13) that "calcic carbide is already made at Spray, North Carolina, at a cost of 20 dollars per ton, by the alternating electric current passed through a mixture of powdered coke and lime. Works have been erected at Niagara which will produce the calcic carbide at 10 dollars a ton, beginning about the middle of this month." This cost seems to be that given by those in-

terested in selling franchises. Some calcic carbide has been made at Spray, but that hitherto used, we believe, has been imported from France and Switzerland and the price quoted in Paris is fr. 25 per kg.—in the neighborhood of $200 per ton. The cost can probably be reduced to $50–100 per ton, and at this price it is said that acetylene would still be cheaper than ordinary illuminating gas or electric light.

The joint commission of the scientific societies of Washington has adopted a resolution opposing the legislation proposed by Senate bill 1552, entitled 'A bill for the further prevention of cruelty to animals in the District of Columbia;' and urging that in the opinion of the commission the proposed legislation is unnecessary, and would seriously interfere with the advancement of biological science in this District of Columbia.

At the first ordinary meeting of the London Society of Engineers on February 3d, Mr. S. Herbert Cox, the new President, delivered his inaugural address, which was devoted to a review of the gold mining industry from an engineering point of view, and the developments and improvements in systems of treatment which have been brought about since the discoveries of gold in California in 1848.

The department of physical geology and mineralogy of the University of Kansas expects to publish about the 1st of April the Volume I. of the University Geological Survey of Kansas, which will be devoted almost exclusively to the stratigraphy of the carboniferous area of Kansas.

The London *Times* states that the late Mr. Henry Seebohm, who, during his lifetime, was a most liberal benefactor to the natural history branch of the British Museum, has, by his will, left the whole of the ornithological collections in his possession at the time of his decease to the same institution. These have now been transferred from his house in Courtfield Gardens, and are found to consist of more than 16,000 bird skins and 235 skeletons. It is, therefore, one of the most important accessions that this department of the Museum has ever received, especially as it is particularly rich in European and north Asiatic species, the representation of which was hitherto not equal to that of other parts of the world. It comprises a series of almost every known species of game bird, including many rare and costly specimens. The collection of thrushes, a group upon which Mr. Seebohm was preparing a monograph at the time of his death, is the finest ever brought together. Of the wading birds, especially the plovers and snipes, Mr. Seebohm had already presented many hundreds of specimens, but the 1,140 skins which he retained in his possession until his death comprised the best of his collection and formed the material upon which he founded his great work on the geographical distribution of the group. Besides the many types contained in the collection, and large series from localities whence the Museum had not hitherto had the opportunity of obtaining specimens, there are also many historical collections, such as Swinhoe's Chinese birds, Pryer's Japanese birds, Anderson's Indian birds, a nearly perfect set of the birds of Mount Kini Balu in Borneo, and the invaluable series obtained by Mr. Seebohm himself in the Petchora and Yenisei Valleys.

The Secretary of the Interior has approved and forwarded to Congress the recommendation of the Commissioner of Education that $45,000 be appropriated this year for the purchase of reindeer, to be distributed among the missionary stations and white settlements of Alaska.

According to the *Lancet* 199 medical journals are published in Paris, the number having been increased by 22 journals during 1895.

The editorial staff of the *Journal of Comparative Neurology* has recently been increased by the addition of Dr. Oliver S. Strong, of Columbia College. Prof. C. L. Herrick is editor-in-chief as hitherto. Business communications should be addressed during 1896 to the managing editor, C. Judson Herrick, at Denison University, Granville, Ohio. Editorial communications may be sent to any one of the three editors.

Garden and Forest states that, on the 5th of February, Mr. Frank H. Nutter read a paper at Taylor's Falls, Minnesota, in which, after discussing in a general way public parks and reservations, with their history and treatment, he gave a preliminary report on the proposed interstate park at the Dalles of the St. Croix,

where something like four hundred acres of land, partly in Minnesota and partly in Wisconsin, have been acquired as a public reservation. The Falls proper are not high, but the Dalles, with their lofty and precipitous rocks on either side, stained with brilliant colors from oxides of copper, or painted with Lichens and Moss, make a most interesting passage of natural scenery.

CHRISTOPHE NEGRI, the Italian economist and geographer, died in Florence on February 18, aged 86 years.

DR. ZELLE, of Brandenburg, has exhibited before the Emperor of Germany specimens of his work in photographing in colors.

THE House Committee on Military Affairs has heard arguments in support of the bill of Mr. Fairchild, of New York, appropriating $500,000 for the establishment of a national military and naval park embracing the Palisades on the Hudson River.

GINN & Co. will publish at once, in their 'Classics for Children' series, *White's Natural History of Selborne*, edited, with an introduction and notes, by Prof. Edward S. Morse.

THE New Jersey Library Association met at Newark, January 30th. The main topic was the relation of the State to libraries, with a view to establishing a New Jersey Library Commission. The two plans chiefly discussed were those of Massachusetts and of New York with its system of traveling libraries. The Massachusetts plan was presented by S. S. Green, of the State Commission, and that of New York by W. R. Eastman, Library Inspector.

ACCORDING to the *British Medical Journal* the Orphanage School of St. Margaret's, in the town of East Grinstead, has been recently visited by diphthera; two of eleven cases proved fatal. Every method was adopted for ascertaining the predisposing cause of the outbreak, but with no success so far as the buildings were concerned. But at length the health officer had the drains outside the institution exposed, when he found that the house drain in its length of communication with the sewer crossed the playground; this length was in a most deplorable state. The communication pipe was only a few inches below the surface, was an old land drain, uncemented at the joints, and these gaping an inch or two; the surrounding soil, whereon the children played, was saturated with sewage. The matter was, of course, put right, but only after human life had been sacrificed, and many children had been sufferers. Moreover, the school inmates had for some time prior to the outbreak been noticed as looking pale and ill, the result, no doubt, of constantly playing in so unhealthy a situation.

IN notes presented before the Paris Academy of Sciences, on January 27th and February 3d, M. Gustave Le Bon claimed that he had demonstrated by photographic effects that ordinary sunlight and lamplight are transmitted through opaque bodies, and states that the body might be a sheet of copper 0.8 mm. in thickness. His experiments have however been questioned by M. Niewenglowski, who states that he has obtained the same effect in complete darkness, and attributes them to luminous energy stored up in the plates.

The Physical Review for March-April will have among the principal articles ones on the Viscosity of Salt Solutions by B. E. Moore; on the the Theory of Oscillating Currents by Steinmetz; on Induction Phenomena in Alternating Currents Circuits by F. E. Millis; on the Magnetic Properties of Cylindrical Rods by C. R. Mann, and a Photographic Study of Arc Spectra by Caroline W. Baldwin. There are several interesting Minor Contributions and a number of Book Notices.

UNIVERSITY AND EDUCATIONAL NEWS.

PRESIDENT JOHN M. COULTER has resigned the presidency of Lake Forest University to become head professor of botany in the University of Chicago. It is understood that part of the money recently given to the University by Miss Culver has been used to endow this chair.

PRESIDENT ELIOT has for some time advocated the reduction of the collegiate course of Harvard University from four to three years. The *Boston Transcript* states that at a recent meeting of the Harvard faculty an informal vote on the proposition showed fifty in favor of the plan and thirty-five against it. Several years ago the faculty formally approved the

plan of reducing the number of courses necessary to a degree from eighteen to sixteen, but it was rejected by the overseers.

Converse College established about five years ago at Spartanburg, S. C., has received a gift of $70,000 from Mr. D. E. Converse, together with $30,000 given by the citizens of Spartanburg, S. C.

At a meeting of the Council of the University of the City of New York, the University medical faculty reported in favor of extending the course for degrees of doctor from three to four years. The Council approved a plan for a College Close which includes an inner court measuring about 250 feet in width by 300 feet in length. Fronting upon this, five residence halls and a dining hall will be built.

DISCUSSION AND CORRESPONDENCE.

KEW'S DISPERSAL OF SHELLS.

Editor of Science: In the review of Kew's *Dispersal of Shells* by Dr. Packard, the reviewer points out certain omissions which could not have been overlooked by Mr. Kew if he had taken the trouble of consulting either Gould or Binney in the original. For a volume of the International Series the book is amazingly provincial. I do not wish by this expression to gainsay its value; it is an exceedingly valuable collection of notes, memoranda and isolated items referring more particularly to the dispersal of shells in England. Dr. Packard has inadvertently overlooked a very important omission in there being no reference to the dispersal of Litorina litorea from its centre at Halifax, Nova Scotia (where it was first introduced from the other side of the Atlantic) along the shores of the Bay of Chaleur, and southward to New York and beyond. In Science News for 1879 Mr. Arthur F. Gray called attention to the successive occurrence of this species as it spread southward along the coast. Professor Verrill in the American Journal of Science, for Sept., 1880, records his observations regarding the dispersion of this species. In the Essex Institute Bulletin for 1880, in a paper on the Gradual Dispersion of Certain Mollusks in New England, I presented a map of the New England coast and upon this was marked chronologically the dates of the appearance of this large and conspicuous mollusk as it found its way south. In this paper I showed what a barrier Cape Cod offered for some years. My last find was at Glen Cove, Long Island. In the same paper I called attention to the dispersion of Pupa muscorum (badia, of Adams) from its first place of observation in Vermont, into various parts of New England. I think Binney was wrong in believing that Helix hortensis was introduced into New England since the advent of the European. I have discovered Helix hortensis on islands in Casco Bay, buried in the lowest deposits of shell heaps containing bones of the Great Auk. The occurrence of this species in such positions could not be accounted for by supposing that the creature had burrowed down to the lowest level of the deposits, for the mass was too compacted to admit of this explanation. I have found them under stones resting on the primitive surface of the ground associated with other species found only in hard wood growths, and now coniferous trees only abound in these places. It is certainly extraordinary that this species is only found living on the outer islands of New England—its habits being entirely different in this respect from its English relative.

Edward S. Morse.

Salem, February 18, 1896.

'SCIENTIFIC MATERIALISM.'

Editor of Science: A few remarks on the article 'Scientific Materialism' in Science, February 14th, may not be out of place.

It seems a case of 'reversion' to speak of 'energy' as something distinct from force, or rather from definite forces. Energy apart from force is inconceivable. To quote Lewis' example, we might as well speak of 'cellarity,' as something apart from cellars!

The definite forces with which science deals are, as every one knows, simply modes of motion. Hence Helmholtz, Tait, Romanes and most modern students have regarded matter, atoms, molecules, all as but expressions of motion, and to be analyzed by the three primary laws of motion and the theorems derived from them. Of course this leads inevitably to a strictly mechanical conception of phenomenal existence.

That the mathematics of mechanics is at present inadequate to solve all the problems offered is simply because, as Whewell pointed out, the procedures of mathematicians do not yet furnish the necessary apparatus. But to say (as on p. 225) that 'the mechanical conception of heat has not been confirmed;' in the face of the latest treatises on thermo-dynamics, based throughout on the laws of motion, is an inexplicable assertion.

The 'way out' of scientific materialism is not by the assumption of an entity apart from attributes; but by the indisputable truth that the laws of mechanics and motion themselves are in final analysis nothing else but laws of thought, of the reasoning mind, and derive their first and only warrant from the higher reality of that mind itself. D. G. BRINTON.

THE RÖNTGEN RAYS.

PROF. RÖNTGEN concludes his paper *On a New Kind of Rays* by showing that they behave quite differently from the visible, the infra-red and the hitherto known ultra-violet rays, and by suggesting that they should be ascribed to longitudinal waves in the ether. He does not, however, indicate how longitudinal waves would account for the phenomena, and probably most readers of his paper have not seen any evident connection between longitudinal vibrations and the behavior of the Röntgen rays. Prof. R. S. Woodward has, however, called the writer's attention to a fact which Prof. Röntgen does not mention, but which may have been present in his mind. If there be longitudinal waves in the ether they must travel with much greater velocity than the transverse waves. Would not this greater velocity account for the absence (partial or complete) of reflection and refraction, and for the penetration—even the fact that this tends to be inversely proportional to the density of the substance? J. McK. C.

CYCLONES AND ANTI-CYCLONES.

TO THE EDITOR OF SCIENCE: In connection with the diagrams published by Prof. Davis in a recent issue of SCIENCE (N. S. Vol. III., p. 197), showing the circulation of the wind and cirrus clouds in cyclones and anti-cyclones, it seems to me a few words should be added in regard to the method by which the results were obtained. Åkerblom, following Hildebrandsson, found the mean directions of the wind and clouds for different directions and intensities of the barometric gradient as observed at the earth's surface and then drawing concentric circles plotted the results around a central area. This method is not the same as finding the relation of the wind and cloud movements to the centers of cyclones and anti-cyclones. A given gradient is sometimes very near the center of a cyclone or anti-cyclone, at other times far removed from it, and again there may be no well-defined cyclone or anti-cyclone, but merely what are called straight isobar gradients.

At Blue Hill I have found considerable differences between the directions and velocities of the upper currents near to and at a distance from the centers of cyclonic and anti-cyclonic action, and it leads me to the conclusion that mixing together observations made at the two points can only lead to confusing results.

The results of Åkerblom for central Germany by no means agree with the results of Dr. Vettin for Berlin as regards the movements of the cirrus in anti-cyclones. Dr. Vettin found the average movements of the cirrus in relation to the direction of the center of the anti-cyclone, and his results agree remarkably well with those found at Blue Hill. (Amer. Meteor. Jour., Vol. X, p. 172.)

H. HELM CLAYTON.

BLUE HILL MET. OBSERVATORY, Feb. 10, 1896.

SCIENTIFIC LITERATURE.

A Handbook to the British Mammalia. By R. LYDEKKER. Allen's Naturalists' Library, edited by R. Bowdler Sharpe. 8°, pp. 339, col. pls. and text figs. London, 1895. 6 shillings.

From early times the British Mammalia have received a large share of attention. Beginning with Thomas Pennant's British Quadrupeds, in 1786, we have: Memoirs of British Quadrupeds (including a Synopsis), by the Rev. W. Bingley (1809); Natural History of British Quadrupeds, by Edward Donovan (1810–1820); Recreations in Natural History, or Popular Sketches of British Quadrupeds, by W. Clarke

(1815-1819); a History of British Quadrupeds, by Thomas Bell (1837); British Quadrupeds, by W. Macgillivray (Jardine's Naturalist's Library, 1838); a new and revised edition of Bell's British Quadrupeds (1874); British Animals extinct within Historic Times, by James E. Harting (1880); and now, A Handbook to the British Mammalia, by R. Lydekker (1895). The present work differs in scope from any of its predecessors inasmuch as it treats of both the living and the extinct species.

The author states in his preface that he makes no claim to personal knowledge of the habits of British mammals, but has drawn largely on Macgillivray's 'Manual,' of which work the present 'may be regarded almost as a new edition.' The principal differences are that Mr. Lydekker has rewritten the whole of the technical matter, has brought the geographic distribution and nomenclature down to date, from his standpoint, and has added a dozen pages of introduction. In the matter of nomenclature the earliest specific name is adopted when it does not happen to be the same as that of the genus in which it is included. On this point American naturalists will be pleased to read the following, from the prefatory note by the able editor of Allen's Naturalist's Library, Mr. R. Bowdler Sharpe. Mr. Sharpe says "I feel convinced, however, that the absolute justice of retaining every specific name given by Linnæus will some day be recognized. Thus, in my opinion, the correct title of the Badger should be *Meles meles* (L.); of the otter, *Lutra lutra* (L.); of the Roe-deer, *Capreolus capreolus* (L.); of the Common Porpoise, *Phocæna phocæna* (L.); of the Killer, *Orca orca* (L.)."

The illustrations are the same as those in the original edition of Macgillivray, which formed the 22d volume of Jardine's Naturalist's Library (1838). They are cheaply printed, without attempt at fidelity of coloring, and differ from the originals in having the foregrounds, as well as the animals, colored. The original skull outlines also are retained, though for what purpose one can hardly imagine, since in most cases it would be difficult, if they were not so carefully labeled, to tell the family to which they belong.

The feature of the British Mammal fauna that strikes the naturalist with greatest surprise is its paucity in species. In his introduction Mr. Lydekker says that, excluding introduced species, only 41 terrestrial mammals 'can be regarded as indigenous inhabitants of Britain during the historic period,' and five or six of these are now extinct; hence the total number of indigenous mammals now living in England, Scotland, and Ireland together is not more than 35 or 36, and the number inhabiting Ireland is only 19. The contrast with any equal area on the continent of Europe or America is striking. For instance, the single State of New York contains at least 53 indigenous land mammals. The explanation of the small number of species in the British Islands is that the early fauna was largely exterminated during the glacial epoch, and the species have not been able to reach the Islands since. This explanation is rendered the more probable by the fact that a dozen of the present mammalian inhabitants are bats—animals that could easily cross the channel—thus reducing the number of truly terrestrial species to a couple of dozen.

The most extraordinary statement I have observed in the book is that the common shrew spends the cold months 'in a state of profound torpor' (p. 78). So far as known, none of the shrews hibernate; on the contrary, they remain active throughout the longest and coldest winters, and even in the far north scamper about on the snow when the temperature is many degrees below zero.

The book as a whole, while lacking the multitude of detailed observations so valuable to the local field worker, is nevertheless a welcome addition to mammal literature and will prove a useful work of reference for many years to come. The closing chapter on 'The Ancient Mammals of Britain' is the most important of all.

C. H. M.

The Cambridge Natural History, Vol. V., Peripatus. By Adam Sedgwick, M. A., F. R. S., Fellow and Lecturer of Trinity College, Cambridge. *Myriapods*, by F. G. Sinclair, M. A., Trinity College, Cambridge. *Insects, Part I.*, by David Sharp, M. A. (Cantab.), M. B.

(Edinb.), F. R. S, London and New York, Macmillan & Co. 1895. 8°, pp. xi+584, and 371 wood cuts. $4.00.

This volume of the *Cambridge Natural History* bears upon its cover the subtitle *Peripatus, etc., Sedgwick;* from which one gains no hint that the book consists chiefly of the first part of an extensive treatise on Insects by David Sharp. But such is the case, more than five-sixths of the volume being on this subject and by this author.

The volume is begun by an essay on *Peripatus* by Adam Sedgwick, the well-known authority on this genus. This essay, which gives the title to the volume, comprises only 24 pages; but it contains a very clear account of the structure, habits and development of these, the most generalized of all arthropods. To this account are added a synopsis of the known species and a map illustrating the geographical distribution of the genus.

Following the essay on *Peripatus* is one treating of *Myriapods* by F. G. Sinclair. This occupies about 50 pages of the volume. After a somewhat rambling introduction, there is given a brief synopsis of the orders and families of this class, based chiefly on the classification of Koch. This is followed by an excellent account of the structure of Myriapods, including a discussion of the distinctive features of each of the four orders, an outline of the embryology of these animals, and a résumé of our knowledge of fossil forms.

The chief interest in the volume, however, centers in the portion written by Mr. Sharp. During the last few years, in this country at least, there has been a great increase in the number of students of insects; and any work on this subject from the hand of a master is sure to be warmly welcomed. In this case the welcome will not be soon worn out. *Sharp's Entomology*, as this and the succeeding volume should be termed, will find and keep a place on the desk of every working entomologist; for, judging by the part before us, this is the best general treatise on insects that has yet appeared in any language.

The great merit of the work lies in the clearness and simplicity of its style, in the excellence of the illustrations, in the extent to which recent contributions to the morphology of insects are included, and in the numerous bibliographical references.

In the division of the Insecta into orders, a conservative plan is followed, only nine orders being recognized; but most of the smaller orders of recent writers are indicated by subheadings. The following is a list of the orders recognized: *Aptera*, *Orthoptera*, *Neuroptera*, *Hymenoptera*, *Coleoptera*, *Lepidoptera*, *Diptera*, *Physanoptera* and *Hemiptera*.

The resurrection of the old name *Aptera* and its application to the order now almost universally known as the *Thysanura* seems to me to be unfortunate. The advantage of retaining the termination 'ptera' for each of the orders, which seems to be the main reason for this course, could have been attained by the adoption of Brauer's term, Synaptera, which is of the form desired, is not in itself misleading, and has not been used in a widely different sense, as is the case with Aptera.

It seems strange too, in the light of recent contributions on the subject, that our author, in his linear arrangement of the orders, should separate so widely the Trichoptera (included by him in the Neuroptera) and the Lepidoptera; certainly these groups have been shown to be more closely allied than any other two of the nine orders.

But criticisms of details in a brief notice of so important a work as this are hardly worth while. It is enough to say that the plan of treatment is excellent, and that it has been carried out in an admirable manner. Entomologists will eagerly await the appearance of the concluding volume.

JOHN HENRY COMSTOCK.

The Herschels and Modern Astronomy. By AGNES M. CLERKE. Published by Macmillan & Co., New York. Pp. vi+224, with three portraits. Price, $1.25.

For this volume, considered as biography, we have nought but praise. In smoothly flowing lines its author gives, not the annals of the Herschel family, but rather a series of pictures from the lives of Sir William, Sir John and Caroline which suffice to present in vivid colors the individuality of brother, sister and son. We catch

a glimpse of the German lad bred to music as a trade and penury as a condition of life, and are hurried along to another glimpse of the fashionable organist of Bath who has risen to the dignity of professional life, who cultivates the sciences as an amateur and, what is more to the purpose, who has become an Englishman by adoption.

We encounter here the clue to William Herschel's success in life, an ardent temperament coupled with an insatiable greed for knowledge and tireless activity in its pursuit. From one point of view it is proper enough to describe as a lucky accident the discovery of Uranus which transformed the amateur into the professional astronomer, supplied by royal favor with opportunity, which it would be mockery to call leisure, for the building of telescopes and their use in explorations of the heavens. But such a characterization of the turning point in William Herschel's career is less than half the truth, and it is the province of his biographer to insist that zeal and diligence such as his make circumstances and constrain luck to follow them.

We shall not pursue the career which rising from humble beginnings culminates in the presidency of the Royal Society, and closes at the end of a long lifetime with perhaps a suggestion of waning enthusiasm coupled with broken bodily powers. Nor can the career of Caroline, all too briefly told, detain us for more than a glance at its simple loyalty and devotion to her brothers' plans in life, a devotion whose dignity is given a tinge of mingled pathos and humor by her own words anent the reluctant change of vocation from music to astronomy: "I have been throughout annoyed and hindered in my endeavors at perfecting myself in any branch of knowledge by which I could hope to gain a creditable livelihood."

The career of Sir John Herschel, marked though it be with brilliant talents and high achievements, conveys nevertheless a sense of disappointment. The father's steadfastness of purpose was lacking in the son, and we confess to a feeling of regret that the telescopes, great and small, which furnished work for his early manhood were laid away in middle life, never again to be seriously used. Whether Sir John's successive inclinations to mathematics, to the bar, to astronomy, chemistry, physics and political office shall be called versatility or vacillation perchance depends as much upon the critic's mood as on aught else, but we cannot doubt that however they be named they were a limitation upon the achievement possible to any talent placed as was his at the beginning of the era of specialization.

With that part of the author's work which sets forth the relation of the Herschels to modern astronomy we are less pleased, and we opine that no injustice is done in characterizing the spirit of her pages with the maxim of political strife, 'Claim everything! Claim it with confidence!' The contributions of the Herschels to modern astronomy are unquestionably great, but they did not build the entire edifice nor even lay all of the foundations. "The powers of the telescope were so unexpectedly increased that they may almost be said to have been discovered by William Herschel." "He made the first attempt to lay down a definite scale of star magnitudes." "Herschel was in the highest and widest sense the founder of sidereal astronomy." "All modern efforts to widen telescopic capacity primarily derive their impulse from Herschel's passionate desire to see further and to see better than his predecessors." Such are samples of what we must consider exaggerated pretentions which may be pardoned in an obituary discourse, but not in a critical estimate of the lines of development of modern science.

Nor is the author altogether free from slips upon the technical side of her subject. Thus if 'a one-inch glass actually quintuples the diameter of the visible universe, it gives access to' one hundred and twenty-five times, and not to 'seventy-five times the volume of space ranged through by the unassisted eye.' But it may well be doubted if the relation itself is not wholly fallacious. Nor is it true that 'the whole system of micrometrical measurements came into existence through Herschel's double-star determinations.' Gascoign, Auzout, Rœmer and probably others used the filar micrometer before Herschel's time, if not in his manner. So also we may be permitted to doubt whether most of the double star orbits at present known have been calculated by the method

of Sir John Herschel since the method has distinctly fallen into disfavor.

Hostile criticism might easily select other and similar matter for adverse judgment, but much as the book is thus disfigured it remains well worth the writing and the reading thereof.

One feature remains which should not be left unnoticed, since in some measure it serves to correct false impressions elsewhere produced. The active and fecund imagination of William Herschel called into existence a swarm of fancies and hypotheses, some of which have become integral parts of the fabric of modern astronomy, while others have been consigned to the intellectual rubbish heap. Types of each class, the failure as well as the success, are presented to the reader, who, without the light which they cast upon the mental characteristics of the man, might well cry out, here is no flesh and blood, but a demi-god set to unravel the universe. G. C. C.

SCIENTIFIC JOURNALS.

THE JOURNAL OF COMPARATIVE NEUROLOGY. DECEMBER, DOUBLE NUMBER.

On the Brain of Necturus maculatus. By B. F. KINGSBURY. A monograph of 65 pages, accompanied by 3 plates, gives the results of the application of the newer methods of staining to the difficult subject of the amphibian brain. The following points are selected from the summary:

1. As compared with certain smaller urodeles, the brain of Necturus is greatly elongated. This appears to be due largely to a greater inequality between the rates of growth of the brain and skull. This is shown, it is thought, especially by (*a*) the almost entire absence of a pons flexure, (*b*) the length of the olfactory nerves, (*c*) the extent of the diatela.

2. A callosum is considered to be entirely absent in the amphibian brain; what has been generally regarded as such is here thought to be a hippocampal commissure, in part at least, although the homology should be dependent on comparative study.

3. An olfactory tract upon the extreme ventral surface of the cerebrum may be traced to the region just caudad of the infundibulum, presumably the region of the albicantia.

4. The paraphysis is well developed and in communication in the adult with the encephalic cavities. The postparaphysis of some authors is not regarded as a true evagination.

5. The ental origins of the cranial nerves are worked out more less completely. For general results reference may be made to tables on pages 179 and 191 of the text. In particular, the motor portion of the facial nerve is shown to have the same mode of origin as in the majority, at least, of vertebrates. The first two roots of the vago-glossopharyngeal group, stated to be the representative of the lateral nerve of 'fishes,' and the nerve termed 'dorsal seventh,' are composed of fibers of the same appearance and terminate in the dorsal region of the oblongata in the neighborhood of the eighth nerve.

6. Mauthner fibers were demonstrated in the adult *Necturus*, *Amblystoma* and *Diemyctylus*. *Amblystoma* is a land form, hence there is no direct correlation with an aquatic mode of life.

7. Myelinic nerve fibres from the mesencephal pass to the ectal surface of the brain immediately ventrad of the epiphysis; these may possibly represent a parietal nerve.

The Cortical Optical Centres in Birds. By DR. LUDWIG EDINGER.

Dr. Edinger is continuing his interesting studies on the phylogeny of the cerebral cortex. He has previously maintained that the olfactory nerve is the first to effect cortical connections and that the cortex of the Ichthyopsida is exclusively olfactory in function. He now finds in the birds a tract which he names the tractus occipito-tectalis, which puts the optic nerve into similar relations with the cortex. This tract becomes medullated some weeks after hatching, exactly as in the mammals, where it has the same termini. The appearance of this tract he correlates with the remarkable visual powers of birds.

In an editorial note Prof. Herrick criticises Dr. Edinger's position with reference to the evolution of the cortex. In particular he differs from Dr. Edinger's opinion that the olfactory function is the only special sense which enters the psychic life of infra-avian vertebrates, but believes that we have evidence that reptiles also

have their optic associations. In fishes even he has already demonstrated an indirect connection between the optic tectum and the axial lobe, which latter must be regarded as functionally and probably morphologically equivalent to the cortex of the higher forms.

In a second editorial Prof. Herrick discusses *Neurology and Monism.* He advocates a *dynamic monism* which stands in strong contrast with the analytical monism of Lloyd Morgan, as presented especially in his recent work on Comparative Psychology. Interesting applications are hinted at in the field of algedonics.

The concluding sixty pages of the number are devoted to book reviews and the bibliography of the half-year past.

SOCIETIES AND ACADEMIES.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, JANUARY 7, 1896.

Dr. Benjamin Sharp made his second communication on the ethnology of Alaska and Siberia, based on collections made by him the past summer during the cruise of the U. S. Revenue Cutter 'Bear.' He described a large collection of instruments, weapons and household utensils and exhibited a number of lantern illustrations.

A minute of the Academy's appreciation of the clearness of judgment, knowledge of affairs and courtesy of personal intercourse which had been the characteristics of the administration of the retiring President, General Isaac J. Wistor, was adopted.

JANUARY 14.

A paper entitled 'New Species of the Halicoid Genus Polygyra,' by Henry A. Pilsbry, was presented for publication.

Mr. Henry A. Pilsbry exhibited and described a specimen of Pleurotomaria from Mullica Hill, N. J. It resembles P. solariformis and P. perlata, but is much more discoidal and is probably the imperfectly described P. crotaloides of Morton.

JANUARY 21.

Papers under the following titles were presented for publication: 'Descriptions of New Species of Mollusks,' by Henry A. Pilsbry; 'The Molting of Birds, with special reference to the Plumages of the Smaller Birds of eastern North America,' by Witmer Stone.

Mr. Edw. Goldsmith described a peculiar crystallization as the result of long-continued evaporation of solutions of Iodide of Potassium. The crystalline form is hexagonal and resembles that which has been obtained from kelp liquids.

Prof. Edw. D. Cope exhibited and described the remains of fossil Balænidæ, of which he had determined sixteen species from the Neocene of Maryland, Virginia and North Carolina. The ear bones of an apparently undescribed Balænoptera and of a Balæna, apparently identical with affinis, were also described.

A resolution was adopted urging on the attention of the Smithsonian Institution the desirability of continuing the rental of a table at the Naples Zoölogical Station for the benefit of American students of biology.

JANUARY 28.

A paper entitled 'Contributions to the Zoölogy of Tennessee, No. 3, Mammals,' by Samuel N. Rhoads, was presented for publication.

The newly elected President, Dr. Samuel G. Dixon, resigned the professorship of histology and microscopic technology in consequence of increase of executive duties.

Dr. Benjamin Sharp continued his communication on the ethnology of Alaska, based on collections made by him during last summer's cruise of the U. S. Revenue Cutter 'Bear.'

In continuation Dr. D. G. Brinton spoke of the supposed influence of Asiatic emigration on the primitive civilizations of America. Reviewing the subject as illustrated by languages, myths, industries, arts and physical characteristics of the tribes, he expressed the belief that there was no reason to suppose that any such influence had been exerted. He was aware that in holding this belief he stood almost alone among American ethnologists, although his views were in harmony with those of some of the best European authorities.

A special committee of the Entomological Section of the Academy reported a mode of exterminating the tussock moth, Orgyia leucostigma, with which the trees of the city streets and squares are so badly infested.

FEBRUARY 4.

PROF. CARTER, of the High School, described a tree about eighteen feet long and ten inches in diameter from ten feet below the surface of a sandstone quarry in Montgomery county, Pa., which had been turned into iron. The Hæmatite had been entirely leeched out of the sand in the vicinity of the tree.

MR. F. J. KEELEY described the characters of a microscopic preparation of jade. It was of interest in connection with the ethnological discussion at the last meeting, as Dr. Brinton believed that American jade could be distinguished from the Asiatic mineral by its microscopic characters.

FEBRUARY 11.

A letter was read from Dr. Karl A. von Zittel, expressing in complimentary terms his gratification at the action of the Academy in conferring upon him this year the Hayden Memorial Geological Award.

Papers under the following titles were presented for publication: 'The Earliest Record of Arctic Plants,' by Theodore Holm; 'A Note on a Uniform Plan of describing the Human Skull,' by Harrison Allen.

PROF. COPE exhibited and described a portion of a cetacean cranium from the Neocene beds of the western shore of the Chesapeake Bay. For a whalebone whale, which it probably was, the frontal and parietal bones are of an unusual character. The presence or absence of dentition had not been determined. The specimen indicated a new genus and species for which the name Metopcetus durinasus was proposed.

EDW. J. NOLAN,
Recording Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON, 255TH MEETING, SATURDAY, FEBRUARY 8.

F. V. COVILLE exhibited specimens of a poisonous cactus *Anhalonium Lewinii* from Ensinal Co., Texas, stating that the tops were sliced and dried and used by the Indians as an intoxicant and stimulant during their religious dances. The cactus was a spineless species and its poisonous juice was apparently for protection.

CHARLES L. POLLARD exhibited a specimen of a desert milkweed, *Asclepias albicans* and commented on its adaptation to desert conditions.

DAVID WHITE exhibited specimens and spoke at some length on '*Some New Forms of Palæozoic Algæ from the Central Appalachian Region.*'. For one of these a delicate ribbon-like dichotomous and spirally-twisted organism, which seemed unique in some respects, the new generic name *Spirophycus* was suggested. Another form, which, like the preceding, was found near the top of the Lower Carboniferous along New River, W. Va., seemed to belong to the group of Devonian Algæ for which Pantallon in 1893 revived Brongniarts genus *Dictyotites*. But this name having long ago become a synonym, was rejected by the reader who proposed to substitute for Dr. Penhallow's group the name *Dictyotopsis*.

Charles L. Pollard read a paper entitled '*Observations on the Flora of the District of Columbia*,' and enumerated a list of 17 plants new to the Washington flora, in addition to those recorded in a previous paper by Mr. Holm. About one-third of these consisted of weeds introduced in ballast or cultivated grounds; an equal proportion contained stray escapes from cultivation chiefly in the public parks, while the remainder comprised species hitherto overlooked or possibly actual accessions to the flora. The author also commented on the structure and relationship of the anomalous *Phacelia Covillei*, giving the views of various botanists upon the species, and showing the proposition that it is a hybrid between *P. parviflora* and *Macrocalyx nyctelea* to be untenable.

F. A. LUCAS,
Secretary.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE Philosophical Society of Washington held its regular meeting on February 15th, at which the following papers were presented:

An *Expedition to Seriland*, by W J MCGEE.

The *Thermophone*, by A. M. RITCHIE, of Boston.

This is a new instrument for measuring temperatures. It is an electrical thermometer of the resistance type, using two resistance coils of different metals. The description was illustrated by an exhibition of the instrument itself.

W. J. Dall described *Some Characteristics of the Genus Spirula.*

J. Howard Gore read a paper on *The Groningen Land-lease System*, being one of perpetual lease to tenants and heirs. Groningen is one of the most prosperous provinces of the Netherlands.

Bernard R. Green,
Secretary.

Meeting of the New York Section of the American Chemical Society.

The New York Section of the American Chemical Society held its regular meeting at the College of the City of New York on Friday evening, the 7th inst.

The programme announced a paper by Dr. R. G. Eccles on 'New Facts about Calycanthus,' and 'Items of Interest from the Cleveland Meeting,' by Prof. A. A. Breneman.

Dr. Eccles stated that the calycanthus seeds, on which his work had been done, were from Tennessee, where they were considered as being poisonous.

He had separated from them an alkaloid different from and more peculiar than any alkaloids known to chemists.

The seeds contain one-third their weight of a bland, pale yellow fixed oil. This oil is wholly removable by petroleum ether. When freed from oil and placed in water the seeds ferment, and the separated alkaloid gives the following reactions: Green color, by strong nitric acid. Pale canary, by hydrochloric acid. Red, by sulphuric acid and bichromate of potash.

Heated with strong caustic potash, a new alkaloid was developed and a sweetish odor produced.

Dr. H. W. Wiley had also examined the seeds, and had found that the alkaloid produced a fine purple color with cane sugar and sulphuric acid. The seeds themselves contain enough sugar to give this reaction. A single seed beaten up with a few drops of water yields the fine purple color on addition of a drop of sulphuric acid.

Ether alone will only extract a trace of alkaloid from the seeds, but a mixture of ether, alcohol and ammonia gives a complete extraction.

The author had isolated two alkaloids, the second in smaller quantity, and a third alkaloid has been found by Dr. Wiley.

The calycanthus-alkaloid gives different colored reaction from the salts.

The means of a series of combustions by Dr. W. A. Noyes gave the following result:

Carbon	71.56
Nitrogen	15.26
Hydrogen	8.34
Oxygen	4.84
	100.00

Dr. Noyes believes the formula to be $C_{17}H_{23}N_3O$.

Its specific rotary power is exceedingly high, being ten times that of cane sugar.

The sulphate is a white prismatic salt giving yellow oxidation products when heated in a sealed tube with nitric acid.

The author described the various salts which he had prepared, and exhibited the color reactions with both the salts and the alkaloids.

Prof. Breneman's review of the Cleveland meeting had been postponed, owing to the length of programme at the January meeting of the section.

The work of Prof. Maberry on oils, his laboratory and apparatus for conducting the protracted distillations of oils under reduced pressure were briefly described.

Dr. Durand Woodman exhibited a simple lecture table apparatus for experimentally demonstrating the luminosity of the acetylene flame. The meeting was then adjourned until March 6th.

Durand Woodman,
Secretary.

NEW BOOKS.

Primary Factors of Organic Evolution. E. D. Cope. Chicago and London, The Open Court Publishing Co. 1896. Pp. xvi+547. $2.00.

Greenland Icefields and Life in the North Atlantic. G. Frederick Wright and Warren Upham. New York, D. Appleton & Co. 1896. Pp. xv+407. $2.00.

Die Insel Tenerife. Hans Meyer. Leipzig, G. Miezel. 1896. Pp. viii+328.

Elements of Botany. J. Y. Bergen. Boston and London, Ginn & Co. Pp. viii+57.